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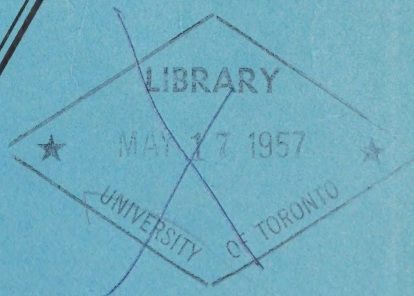


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ANNUAL REPORT
of the Fiscal Year Ended
March 31, 1956

DEPARTMENT OF TRANSPORT
1955-56



**Submitted under the provisions
of the Department of Transport
Act**

Canada. Dept. of Transport
CAIT-A55



CANADA

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DEPARTMENT OF TRANSPORT

ANNUAL REPORT

FOR THE FISCAL YEAR ENDED
MARCH 31

1956

Submitted under the provisions of the
DEPARTMENT OF TRANSPORT ACT



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DEPARTMENT OF MINISTERS

ANNUAL REPORT

FOR THE FISCAL YEAR ENDING

MARCH 31

1956

Report made by the President of the
Department of Ministers

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*To His Excellency the Right Honourable Vincent Massey, C.H., P.C.,
Governor General and Commander-in-Chief of Canada.*

MAY IT PLEASE YOUR EXCELLENCY:

The undersigned has the honour to present to Your Excellency the Annual Report of the Department of Transport, for the fiscal year ended March 31, 1956.

GEORGE C. MARLER,
Minister of Transport.

MINISTRY OF TRANSPORT

MINISTER

BOARDS, COMMISSIONS AND GOVERNMENT-OWNED COMPANIES

Air Transport Board
Board of Transport Commissioners
Canadian Maritime Commission
Canadian National Railways
Canadian National (West Indies) S.S. Co.
Canadian Government Merchant Marine, Ltd.
Canadian Overseas Telecommunication Corporation
National Harbours Board
St. Lawrence Seaway Authority
Steamship Inspection Board

ACTS ADMINISTERED BY THE DEPARTMENT OF TRANSPORT

GENERAL

Bills of Lading Act
Canadian Overseas Telecommunication Corporation Act
Department of Transport Act
Pipelines Act
St. Lawrence Seaway Authority Act
Telegraphs Act
Transport Act

AIR SERVICES

Aeronautics Act
Carriage of Goods by Air
Radio Act

MARINE

Belleville Harbour Commissioners Act
Canada Shipping Act
Canadian Maritime Commission Act
Canadian National Steamships Act
Government Harbours and Piers Act
Government Vessels Discipline Act
Hamilton Harbour Commissioners Act
Live Stock Shipping Act
National Harbours Board Act

Navigable Waters' Protection Act
New Westminster Harbour Commissioners Act
North Fraser Harbour Commissioners Act
Port Alberni Harbour Commissioners Act
Toronto Harbour Commissioners Act
Water Carriage of Goods Act
Winnipeg and St. Boniface Harbour Commissioners Act

RAILWAYS

Canadian National Railways Act
Canadian National-Canadian Pacific Act
Canadian National Railways Pensions Act
Government Railways Act
Intercolonial Railway and P.E.I. Railway Employees Provident Fund Act
Maintenance of Railway Operations Act
Maritime Freight Rates Act
Railway Act

REPORT OF THE DEPUTY MINISTER OF TRANSPORT

FOR THE FISCAL YEAR ENDED MARCH 31, 1956.

To the Honourable George C. Marler,
Minister of Transport.

SIR,—In the fiscal year 1955-56—the period covered by this report—the Department entered its twentieth year. It was first established on November 2, 1936, to co-ordinate government transportation and communication facilities and activities under one Ministry.

During this period, there have been marked developments in transportation and communication. Responsibilities assumed by the Department have kept pace with such expansion. Developments in aviation and electronics have been possibly more spectacular than in other forms of transportation but the added facilities have also covered other services. Thus, northward trend in development has seen expansion in the Department's marine facilities as well as in aviation.

During the fiscal year under review, the St. Lawrence Ship Channel Committee which you appointed in 1954 to study further developments of the Ship Channel completed its report. Extensive plans were made for the Department's responsibilities in scientific research during the International Geophysical Year which will cover the period July 1, 1957, to December 31, 1958. Both the Meteorological and Telecommunications services will be taking part in this work at Canada's most northerly weather station at Alert, N.W.T., as well as at Resolute, N.W.T., Edmonton, Alta., Moosonee, Ont. and other places.

Departmental changes during the year saw all administrative services, except Law, Departmental Secretary and Real Estate, brought under J. R. Baxter who heads a newly created Administration and Personnel Branch. During the year, R. J. Burnside, Assistant Director of Canal Services, was promoted to the position of Director, filling the vacancy caused by the resignation of K. F. Mickleborough. Norman Wilson was appointed Director of Marine Services, succeeding H. V. Anderson, retired. F. G. Nixon was appointed Controller of Telecommunications, succeeding G. C. W. Browne, retired. P. Kuhring was appointed Chief Engineer of the St. Lawrence Ship Channel, succeeding F. S. Jones, retired.

ADMINISTRATION

Expenditures by the Department of Transport during the fiscal year under review amounted to approximately \$136,000,000, a decrease of around \$25,000,000 from the previous year due mainly to the elimination of the Canadian National Railways deficit which was \$28,750,000 in 1954-55. Departmental revenues totalled \$11,700,000, an increase of \$200,000 over the previous year. Also, expenditures made by the Department of Transport from funds provided by other departments or agencies, mainly the Department of National Defence, amounted to \$11,672,033 as compared with \$9,726,868 in 1954-55. Much of the work for the Department of National Defence was in the field of airport construction or land acquisition for this purpose.

For the third year in succession, purchases of materials, supplies and equipment by the Stores Division have cost about \$20,000,000. Contracts for construction, repairs and other works were awarded to the value of approximately \$44,000,000, an increase of \$24,000,000 over the previous year. Airport and general aviation requirements continued to play a large part in departmental construction.

Negotiations for the purchase of approximately 7,700 acres of land from some 606 property owners were undertaken by the Real Estate Division of the Department. Much of this was for the Department of National Defence and the St. Lawrence Seaway Authority. A reduction in the number of easements and settlements of damage claims was recorded. The Legal Services of the Department prepared approximately 3,100 legal documents during the year, reflecting increasing operations of the Department.

The average 1955-56 strength of the Department of Transport was 11,510, a slight increase over the preceding year. The Personnel Division of Administration and Personnel undertook recruitment, by advertising, of ships officers and crews for special lightering operations in the Hudson Bay during the summer navigation season. New career programmes in the professional and non-professional Meteorological classes were devised to enable progress to more senior classifications. An extensive training programme was undertaken to train air traffic controllers at departmental schools established at Toronto and Winnipeg. The field training programme of the Division provided courses to a total of 954 persons.

Office Services Division instituted a revised inventory plan of office machines and equipment and established new procedures for the control and supply of such material.

AIR SERVICES BRANCH

Civil Aviation—With increasing traffic on the air lanes, air control operations become more important. Air Traffic Control training schools were opened in Toronto and Winnipeg where three-month courses are given prior to students being posted to towers for additional training. The utilization of radar equipment in air traffic control is being undertaken and contracts have been let for 4 short distance and 15 long distance surveillance radar sets. There are now 23 control towers and 7 control centres in operation on the Department of Transport's 15,000 miles of controlled airways.

At the close of the fiscal year, 8,676 pilot licences of all classes were in good standing as compared with 7,751 the previous year. A feature of the increase is that licences issued in the Senior Commercial and Airline Transport category increased from 111 to 539. This was attributable to some extent to the demand for senior pilots for DEW Line and Mid-Canada Line airlift operations.

Construction—Airport terminal buildings were completed during the year at Seven Islands, Que., and at Saskatoon, Sask. Contracts were awarded and work commenced on terminal buildings at Gander and Stephenville, Nfld., Quebec and Montreal, Que., Windsor, Ont., and Comox, B.C. Considerable work was done on runways, taxi strips and aircraft parking aprons.

Meteorological—New international air services from Canada to Holland and Mexico have necessitated the provision of new meteorological services. At Vancouver, the Canadian terminal of the air service to Amsterdam, facsimile weather maps were found to be essential in meeting requirements. Toronto and Windsor terminals for the new air services to Mexico have also required special facilities.

There has been a marked increase in meteorological services required during the fiscal year to keep abreast of the international traffic on existing air routes. The meteorological teletype system was expanded to 28,000 miles of circuit with 286 connecting stations, and the "weatherfax" system reached a total of 13,000 airline miles of circuit with 60 connecting stations.

A new surface and upper-air observing station was established at Sachs Harbour, Banks Island, in the Western Arctic.

Telecommunications—Radio stations of all types in operation in Canada numbered approximately 43,000, an increase of nearly 1,700 over the previous year, reflecting the greater use being made of radio communication in commercial and governmental operations. A new monitoring station was commissioned at Beaumont, Que., for radio stations in the lower St. Lawrence area, and construction work was commenced on a station at Almonte, Ont., to replace the Ottawa monitoring station.

In radio aviation, the first segment of a trans-Canada VHF-omni range went into operation between Montreal and Windsor with installations also at Ottawa, Stirling, Toronto and London. Eventually this system will extend from coast to coast.

CANAL SERVICES

On September 1, the Canso canal, providing navigation through the Cape Breton end of the Canso Causeway, was opened provisionally to navigation but limited to vessels with a draft not exceeding 10 feet. By December this draft was increased to 12½ feet. Freight through the canal totalled 14,607 tons.

Freight tonnage through the Welland and St. Lawrence River canals increased approximately 19 per cent over the previous year. Although freight through the Canadian lock of the Sault Ste. Marie canal was down by approximately 15 per cent from the previous year, the combined freight through the U.S. and Canadian locks totalled 114,555,298 tons, an increase of 29,137,640 tons over the previous year.

MARINE SERVICES

Plans are well advanced for the creation of a district marine agency for the Northwest Territories and Western Arctic due to increased traffic in northern waters. Existing marine agencies all report increased activities during the year.

Aids to Navigation—The new White Island light station, replacing the White Island lightship, was towed from Quebec in June, 1955, and placed in position. By the close of the fiscal year the construction work of the light station was well advanced. A contract was awarded for a new light station to replace the Sand Heads lightship at the mouth of the Fraser River, B.C.

Nautical Division—At December 31, 1955, there were 17,188 vessels of 2,316,396 gross tons registered in Canada. Pilotages performed totalled 32,939 compared with 30,737 during the previous year and movages totalled 9,259 compared with 8,435. Pilotage dues amounted to \$3,021,990.30.

Ships and Floating Equipment—The Department assumed responsibility for much of the unloading of supplies in Hudson Bay and Hudson Strait for special construction work being undertaken there. One diesel tug and 27 barges were added to the fleet for northern operations and two barges and two diesel tugs were under construction. During the year the new automobile

and passenger ferries, *William Carson* and *Bluenose*, were accepted by the Department and turned over to the Canadian National Railways for operation. A lighthouse supply and buoy vessel for the Victoria, B.C. Agency, christened the *Sir James Douglas*, was launched.

St. Lawrence Ship Channel—By the close of the 1955 navigation season, the original 1952 dredging contract was almost completed. Meanwhile the St. Lawrence Ship Channel Committee 1954 has recommended the completion of the widening of the channel to an 800-foot minimum from Montreal to Quebec as a long-term project, and plans were in hand for a new project.

As a result of icebreaking, there was no flooding on the south shore of the St. Lawrence River opposite Montreal. Icebreaking continued on the river throughout the winter and icebreakers opened a channel to Montreal on February 24. The first ship reached that port under icebreaker escort on April 2.

RAILWAY SERVICES

Canadian National Railways produced a surplus of \$10,717,689 for the calendar year 1955, as compared with a deficit of \$28,758,098 in 1954.

The Hudson Bay Railway carried a total of 578,415 tons of revenue freight, an increase of 120,504 tons over the previous year. Approximately 80 per cent of the tonnage was wheat for export. Some 15,129,467 bushels were carried, an increase of 2,510,434 over the previous year. This was the largest quantity of grain handled by the railway since the Port of Churchill was opened.

Respectfully submitted,

J. R. BALDWIN,

Deputy Minister.

AIR SERVICES BRANCH

SIR,—The annual reports for the fiscal year ended March 31, 1956, covering the Civil Aviation, Telecommunications, Meteorological and Construction Divisions under my charge and direction as Director of Air Services of the Department of Transport, are submitted.

The growth in aviation generally throughout Canada continues to result in demands on the Air Services Branch for increased services.

To cope with a critical shortage of qualified staff, training schools were established at Toronto and Winnipeg for air traffic controllers and further subsidized courses were arranged with Radio Schools for the training of radio operators. Improved career programmes for meteorological employees were approved although recruiting of new employees, particularly in the professional class, has not met requirements.

A new Omni-Range airway between Montreal and Windsor was commissioned in February, 1956, and plans are proceeding for the extension of these facilities across Canada.

Contruction of two new terminal buildings, one at Seven Islands, Que., and one at Saskatoon, Sask., was completed, and new runways were completed or existing runways lengthened at some ten airports across Canada. Additional new construction was commenced at ten other airports.

In the Civil Aviation Division, re-organization of functions in the Air Regulations and Airways Sections, and the establishment of new Flight Operations Section were completed during the period under review.

Airlifts associated with the Distant Early Warning and Mid-Canada Lines continued to result in increased participation by the Air Services Branch, particularly the Air Regulations aspect. These activities also necessitated the establishment of new forecast offices and associated communications.

Respectfully submitted,

A. DE NIVERVILLE,
Director of Air Services.

J. R. BALDWIN, Esq.,
Deputy Minister of Transport,
OTTAWA.

CIVIL AVIATION DIVISION

SIR,—I have the honour to submit the following report of the Civil Aviation Division for the fiscal year ended March 31, 1956.

The Controller of Civil Aviation is responsible to the Director of Air Services for the application of Air Regulations and Air Navigation Orders; personnel licensing and aircraft registration; investigation and analysis of aircraft accidents; issuance of operating certificates; categorization of civil flying instructors; supervision of flying clubs and schools; civil aviation medicine; design, airworthiness of construction, and performance of aircraft; inspection and licensing of airports and seaplane bases; selecting, overall planning and maintenance of government aerodromes; airport revenue; the selection of sites for radio aids to navigation; instrument landing systems; ground controlled approach and approach surveillance radar; non-directional radio beacons; the protection of air navigation from ground hazards; the establishment of zoning requirements for airports; the establishment of instrument approach to land procedures; air traffic control, which includes approach control service, area control service, flight information service, alerting service for search and rescue, customs notification service, and aircraft identification service; assistance to municipalities in the selecting and planning of sites for airports; designation of air routes and airways; the maintenance and operation of departmental aircraft and training of departmental pilots and air engineers; liaison with the Department of National Defence and civil operators relative to operational requirements with regard to airports and airways.

The services of the Civil Aviation Division for the year under review were rendered by the following Sections:

- Administration,
- Air Regulations,
- Airways and Airports,
- Aeronautical Engineering,
- Flight Operations.

ADMINISTRATION SECTION

The publication and distribution of regulations, orders, circulars, NOTAM's, handbooks, manuals, etc., are included in the functions of the Administration Section, as well as the preparation of reports and the collection and dissemination of information relative to aviation generally. This service is extended to the Construction and Telecommunications Divisions, Air Services Personnel, and the office of the Director of Air Services.

AIR REGULATIONS SECTION

Training, Testing and Licensing of Airmen

The scheme of assistance for private pilot training was continued during the past year. Approved courses for private pilot training were conducted by 75 flying clubs and commercial flying schools. Facilities were also provided for approved courses for commercial pilot training. A total of 122,000 hours of training was carried out by these clubs and schools.

The large increase in senior pilot licences is partly attributable to the demand for this type of pilot for the DEW Line and Mid-Canada Line airlift operations.

PERSONNEL LICENSING STATISTICS

	In Force 31/3/55	Issued	Lapsed	Re- newed	Sus- pended	Re- instated	Can- celled	In Force 31/3/56
Pilots—								
Glider.....	162	46						208
Private.....	5,034	1,982	3,006	1,454	7	9	64	5,402
Commercial.....	1,712	512	1,001	770	3	4	112	1,882
Senior Commercial.....	342	376	133	99	1	1	70	614
Airline Transport.....	663	163	126	87	2	2	9	778
Air Navigator.....	57	11	10	7			1	64
Air Traffic Controllers.....	244	52	23	12			1	284
Flight Engineers.....	24	2	5	5				26
Aircraft Maintenance Engineers..	1,448	244	138	82	5	6	18	1,619

The number of pilots tested for categorization as flying instructors was 627. Two instructor refresher courses managed jointly by the Royal Canadian Flying Clubs Association and the Air Industries and Transport Association were sponsored by the Department. From these courses, 59 instructors graduated.

At the end of the fiscal year there were 1,030 instrument rated pilots in Canada, an increase of 140 over the previous year. These pilots are flight checked at regular intervals by Civil Aviation inspectors and approved company check pilots in order to maintain a high standard of instrument flying.

Route competency checks of aircrew on scheduled and non-scheduled airline flights were conducted by Civil Aviation inspectors.

Flying Clubs and Schools

At the end of 1955 there were 38 member clubs of the Royal Canadian Flying Clubs Association with a total membership of 7,765. During the year 1955, instructional hours flown totalled 82,596 and the number of aircraft utilized for instructional purposes was 143. The number of students instructed and graduated as private pilots was 1,120 and as commercial pilots, 83.

Commercial flying schools numbered 48 at the end of 1955. During the year 1955, the number of students instructed and graduated as private pilots was 498, the number graduated as commercial pilots was 109 and the number of instructional hours flown was 40,900. Of the 48 commercial flying schools, 35 are members of the Air Industries and Transport Association.

Aircraft Registration

Certificates of Airworthiness for Export were issued for nineteen DHC-2 (Beaver) and two DHC-3 (Otter) aircraft for export to Australia, Finland, United States of America, France, South America, West Africa, Mexico, South Africa, Laos and Yugoslavia.

The increase in the number of aircraft imported and registered in Canada was considerable. This increase was largely due to the demanding requirements of the DEW Line and Mid-Canada Line airlift. The total number of aircraft on the Aircraft Register as of March 31, 1955, was 2,825. During the fiscal year, 508 aircraft were registered, and 123 registrations were cancelled. These cancellations were due to obsolescence, severe damage sustained in accidents or aircraft sold out of Canada. The total number of registered aircraft in Canada at March 31, 1956, was 3,210.

Flight Tests

From February to December 1955, the departmental test pilot was in England attending the Empire Test Pilot School at Farnborough where he flew about twenty types including piston-engines, turbo-prop and four jet power aircraft. The lessons learned can be applied directly to jet transport aircraft now under development, where the major problems of high speed and high altitude are common to this category.

In January and February of 1956, type-approved flight tests were carried out on the Belaero S-45, a Czechoslovakian product which has been operated in Europe for the past ten years but here, for the first time, the aircraft was evaluated to ICAO Airworthiness Standard.

Investigation of Aircraft Accidents

During the year, 264 accidents were reported which involved Canadian registered aircraft engaged in civil flying, as compared with 201 accidents in 1954. These figures do not include minor accidents where there were no injuries.

There was an increase in the number of aircraft registered in both the commercial and private categories during the year. Taking these additional registrations into consideration, the ratio of accidents to registered aircraft in the commercial category showed an increase of .86 per cent over last year and in the private category, in which the number of aircraft registered increased by 13.9 per cent with a corresponding increase in private pilot licences of 11.63 per cent, the increase in accidents was 1.56 per cent.

As for the past eight years, landings accounted for the largest number of accidents. This year, however, there was a proportionate increase of 50 per cent in take-off and 30 per cent in en route accidents over last year.

Air Carrier Operations

At March 31, 1956, there were 338 commercial air carriers operating the various types of commercial air services in Canada and holding one or more valid operating certificates. This number consisted of 205 Canadian and 133 foreign and Commonwealth operators.

SUMMARY OF COMMERCIAL AIR SERVICES CERTIFICATED BY OPERATING CERTIFICATES

At March 31, 1956

Type of Service	Certificated Services	Op. Certs. Valid	Op. Certs. and Endorsements issued
<i>Scheduled—</i>			
Canadian	43	24	21
Foreign and Commonwealth	22	20	6
<i>Non-Scheduled—</i>			
Foreign	125	125	43
Flying Clubs and Schools	92	92	39
*All others	621	200	228
Totals	903	461	337

*Commercial air services such as non-scheduled between specific points, charter, contract, recreational flying, aerial photography and survey, aerial pest control, aerial advertising, aerial patrol and inspection, and philanthropic.

CIVIL AVIATION MEDICINE

The Division of Civil Aviation Medicine of the Department of National Health and Welfare acts in an advisory capacity to the Air Services Branch for the health, safety and comfort of aircrew, ground crew and passengers by air. The Division has in particular acted as medical adviser to the Controller of Civil Aviation in the medical requirement for civil aviation personnel.

The rapid expansion of civil aviation in Canada has produced a corresponding increase in requests for advice. A considerable portion of this advice has been concerned with the administration of Air Regulations as applied to medical requirements for aviation personnel licensing by the Department of Transport. Medical examination reports and electrocardiograms received for review have increased from approximately 3,000 in 1945 to nearly 18,000 in 1955.

The policy of establishing a District Medical Officer on a part-time basis in each of the Department of Transport district offices has proven its value in expediting issue and renewal of pilot licences at the district level. Since many medical problems can be resolved at the district level with the assistance of the District Medical Officer, the liaison between the primary medical officer and the Department of Transport has been improved.

The problem of early rehabilitation of commercial pilots following illness or injury, the problem of the older but experienced commercial pilot with a partial disability, and the internationally acceptable standards of vision and hearing have been given careful consideration and discussed at length with medical specialists in the appropriate field.

During the year, work proceeded on the revision of *Department of Transport Physical Standards for Aviation Personnel*, and the *Department of National Health and Welfare Handbook for Civil Aviation Medical Examiners*. When this work of revision is completed, it is intended to combine their contents in one manual titled *Manual of Civil Aviation Medical Examiners*.

The establishment of regional medical Consultant Boards has now been completed in five of the seven centres necessary. These Boards are particularly useful in the settlement of contentious cases of marginal physical disability as well as in the assessment of physical competence of aircrew concerned in aircraft accidents. With the increasing number of pilots in the older age group the need for careful and unbiased assessment becomes increasingly obvious.

Considerable progress has been achieved in the facilitating of crash injury reporting, investigation of fatigue and reasonable hours of duty for commercial pilots and air traffic control personnel, and the problem of air transportation of medical supplies for injured personnel related to civil defence.

AIRWAYS AND AIRPORTS

The re-organization of the Civil Aviation Division resulted in the Airways and Airports Section being divided into two units under an Administrator of Airways, and an Administrator of Airports.

AIRWAYS

Aids to Navigation

The first segment from Montreal to Windsor of a trans-Canada "Very High Frequency" omni range (VOR) system of airways was flight checked and commissioned.

Site selections and flight testing of new VOR locations were carried out at Gander, Nfld.; Kenora, Ont.; Winnipeg and Brandon, Man.; Broadview, and Lumsden, Sask.; and Vancouver, B.C. There were approximately 1,800 miles of new airways designated which involved some relocation of existing airways.

A *Manual of Criteria for Aircraft Holding and Approach to Land Procedures* has been completed, which will be the basis for the standardization of all approach procedures in Canada for civil and military aircraft.

A manual for the standardization of calibration and flight checking procedures of radio aids to navigation is at present being written. A new list of all danger and prohibited areas in Canada has been prepared in co-operation with the Department of National Defence. A study of the Decca and Dectra systems of air navigation is being made.

Operational Requirements

An *Airport and Aerodrome Directory* containing information regarding some 800 aerodromes—land and water—in Canada was compiled. Another directory listing information regarding structures which constitute a hazard to aerial navigation is being prepared, as also is a revised manual of criteria for assessing hazards to aerial navigation in the vicinity of airports and airways. The development of plans and agreements with twenty municipalities covering construction of landing strips under departmental financial assistance policy was carried out. Approximately 2,000 applications for permission to erect radio and television antenna were received and dealt with.

SUMMARY OF AIRPORT LICENCES

In Force 31/3/55	Issued	Extended	Cancelled	In Force 31/3/56
479	24	249	4	499

AIRPORTS

Maintenance

The Department operates and maintains over one hundred airports. The work embraces field surfaces, runways, taxiways, pavement, roads, drainage, hangars, workshops, buildings, heating, water supply, sewage disposal, and lighting.

Fire Protection

Regular courses of instruction in fire prevention and fire fighting practices were established at Ottawa and Toronto, and a third is being organized at Edmonton.

In an effort to reduce the incidence of fire at northern sites, a fire inspection was made at these sites during the year and is to be continued annually.

Facilities at airports for crash fire fighting and rescue work were extended and training was intensified.

Revenue

Total revenue received from airports for the fiscal year 1955-56 was \$6,266,535.15, an increase of \$884,246.66 over the previous year.

The increase is attributed mainly to greater flying activities, and a substantial increase in the amounts received from landing, and gasoline and oil concession fees.

At the end of the year, there were 1,030 revenue leases and licences in force.

AIR TRAFFIC CONTROL

The Department now operates twenty-three airport control towers and seven control centres. One new control tower was established at Mont Joli, Que., during the year. The number of controlled operations—landings and take-offs—at civil airports during the year was 1,900,810, an increase of 12 per cent over last year. The seven area control centres handled 1,587,293 fix postings, an increase of 18 per cent. In addition, these centres handled 486,094 IFR flight plans and 245,833 VFR flight plans. This represents an increase of 12 per cent.

An additional approach control service was inaugurated at Winnipeg, thus bringing to three the number of locations from where this service is provided.

The utilization of radar equipment in air traffic control is being introduced. Orders were placed for equipment to be installed at Gander, Montreal, Toronto, Winnipeg and Vancouver, and delivery was made at Gander before the end of the fiscal year.

Air Traffic Control Training Schools were established at Toronto and Winnipeg to train Air Traffic Controllers, who, when qualified, will fill current vacancies and provide trained personnel for the future needs of the Department. These schools operate four courses per year with an enrolment of thirty in each course. The total enrolment at the two schools will be in the order of 240 students per year.

AERONAUTICAL ENGINEERING

During the year, five aircraft type approvals were granted: two for aeroplanes, two for helicopters, and one for a glider.

Approval was given of aircraft repair schemes and modifications as well as of new equipment.

Supervision was maintained over all civil operators and manufacturers, including repair servicing and distribution organizations, to ensure continuance of airworthiness standards. In this connection 2,805 aircraft inspections and 673 visits to organizations' inspection staffs were made.

The number of air engineer examinations held was 898.

An inspection trip was made to check the overseas maintenance and servicing facilities of one Canadian international carrier.

Liaison was maintained with the Air Industries and Transport Association, the Royal Canadian Flying Clubs Association, and the Canadian Owners and Pilots Association.

Close contact with both British and United States airworthiness authorities on technical subjects was maintained.

Current technical literature was studied and reviewed and the aeronautical engineering and aircraft inspection staff were kept abreast of modern development.

FLIGHT OPERATIONS

The Flight Operations Section is responsible for the operation and maintenance of the departmental fleet of aircraft. The Section is responsible for the internal training of pilots and engineers within Headquarters and the Districts, to maintain their qualifications to a satisfactory standard.

During the year, one DC-3 aircraft was purchased to provide transportation for personnel and cargo to northern stations and is being used jointly by the Districts of Winnipeg and Edmonton. This aircraft will ultimately be converted for calibration purposes. Three Apache light twin-engine aircraft were purchased to provide economical transportation for inspection duties. These aircraft replaced two obsolete Lockheed 10A which were sold.

At the end of the fiscal year, the Department was operating twenty-seven fixed-wing aircraft and four helicopters. The fleet comprises the following: one Vickers Viscount for training and executive transportation; four DC-3, two of which are specially equipped for calibration of radio aids to navigation, one for transportation and cargo, and one for executive transportation; two Lockheed Lodestars, used for transportation and training; nine Beechcraft 18, and two Lockheed 12A, used for district transportation and calibration; three Piper Apache, used for inspection and transportation; five Beaver, also used for district inspection, transportation and accident investigation; and six Bell 47 Helicopters, four of which are attached to the CGS *C. D. Howe* and *d'Iberville* on Arctic patrol.

Two Bell 47G helicopters were purchased by the Department of Mines and Technical Surveys for operation by this Department from the deck of the new hydrographic survey ship CGS *Baffin* in Arctic waters.

The Vickers Viscount was placed in service with the Department in September, 1955. Since that time four executive pilots have been fully trained on this aircraft and training is proceeding to bring a number of inspectors up to first officer standards. The aircraft has also been used, to a limited extent, on executive transportation. The training programme on this particular aircraft has enabled the technical staff to gain first-hand experience on modern pressurized turbo-prop equipment.

The Section has been organized to extend and improve its facilities for training. Twelve pilots received advanced instrument training and conversion courses on fixed-wing aircraft and on the flight simulator, and three pilots were given training on helicopters.

DEPARTMENT OF TRANSPORT AIRCRAFT FLYING TIME FISCAL YEARS
1954-55 AND 1955-56

	Purpose of Flight	Hours Flown	
		1954-55	1955-56
Fixed Wing.....	Executive Transportation.....	575 hrs.	632 hrs.
	Inspection.....	1908 hrs. 05 min.	1872 hrs. 55 min.
	Transportation.....	1906 hrs. 05 min.	2252 hrs. 55 min.
	Calibration.....	1405 hrs. 55 min.	1580 hrs. 40 min.
	Ferry.....	22 hrs. 50 min.	27 hrs. 40 min.
	Test.....	55 hrs. 20 min.	41 hrs. 55 min.
	Training.....	795 hrs. 50 min.	1084 hrs. 30 min.
	Total.....	6669 hrs. 05 min.	7492 hrs. 35 min.
Helicopter.....	Shipboard Operations and Transportation.....	62 hrs. 30 min.	289 hrs. 40 min.
	Ferry.....	16 hrs. 40 min.	87 hrs. 55 min.
	Test.....	12 hrs. 35 min.	10 hrs. 50 min.
	Training.....	216 hrs. 30 min.	200 hrs. 05 min.
	Total.....	308 hrs. 15 min.	587 hrs. 30 min.

During the winter months, a helicopter was based on the CGS *d'Iberville* on ice breaking operations in the St. Lawrence River. This experiment was considered successful and will become established procedure.

PARTICIPATION IN INTERNATIONAL CIVIL AVIATION

INTERNATIONAL CIVIL AVIATION ORGANIZATION

The Department of Transport maintains a permanent member on the ICAO Council and delegates for each session of the Assembly are appointed. At the meetings of committees, panels, commissions and conferences held during the year, Canada was represented by officials of the Department.

The Council of ICAO and its committees were in almost continuous sessions throughout the year.

The *Ninth Session of the Assembly* was held in Montreal from May 31 to June 13, 1955. Brigadier C. S. Booth, chief delegate for Canada, was elected president of the Assembly.

A special meeting on hearing and visual requirements for personnel licensing was held at Paris from April 25 to May 5, 1955. The Canadian delegation was headed by the Chief, Civil Aviation Medicine, Department of National Health and Welfare.

The *Airworthiness Panel* was convened in Paris from June 14 to July 8, 1955, to deal with the problems of international airworthiness standards. The Panel drafted a revision to Annex 8 and the complementary part of Annex 6 which deal with this subject.

The second *Air Navigation Conference* was held in Montreal from August 30 to September 27, 1955. The principal subjects under review at this conference were visual flight rules, communications, flight plans, approach and landing, long distance aids, weather minima, marshalling signals for helicopters, and avoidance of collisions.

The first *All Pacific Regional Air Navigation* meeting was held at Manila from October 27 to November 25, 1955. The general topics discussed were air navigation and air traffic facilities and procedures and the construction of modern aerodromes in relation to the economics of the States involved and to the aviation requirements of the region.

A panel was convened at Montreal February 14-22, 1956, to investigate ways and means of ensuring adequate, constant and effective vertical separation of aircraft flying at all altitudes.

SOUTH PACIFIC AIR TRANSPORT COUNCIL

The member nations constituting the South Pacific Air Transport Council are Australia, New Zealand, United Kingdom, and Canada.

The purpose of the Council is to resolve technical and financial problems relating to air navigation across the South Pacific Ocean, including contributions toward maintenance costs.

Canada's financial participation is limited to a share of the cost of maintenance of Nadi Airport.

Respectfully submitted,

R. DODDS,
Controller, Civil Aviation.

A/V/M A. DE NIVERVILLE, C.B., LL.D.,
Director of Air Services,
OTTAWA.

CONSTRUCTION DIVISION

SIR,—I have the honour to submit the following report of the Construction Division for the fiscal year ended March 31, 1956.

This Division is responsible to the Director of Air Services for construction required by the Civil Aviation, the Telecommunications and the Meteorological Divisions and, on request, for runway construction and airport lighting for the Department of National Defence and includes:

- (a) Airport construction.
- (b) Planning, erection and modification of buildings.
- (c) Provisions of services, i.e., power, water and sewer.
- (d) Airport and airway lighting.

AIRPORT CONSTRUCTION

New runways were completed or old runways lengthened and strengthened for modern aircraft at the following civil airports: Gander, Nfld.; Trenton, N.S.; Lake Eon (Gravel) and Quebec City, Que.; Windsor, London, and Lakehead, Ont.; Prince Albert, Sask.; Fort McMurray and Calgary, Alta.

Construction of new runways or lengthening and strengthening was commenced or continued at: Charlottetown, P.E.I.; Fredericton, N.B.; Mont Joli, Que.; Toronto (Malton), Timmins and Kenora, Ont.; Winnipeg, Man.; Saskatoon, Sask.; Prince George and Smithers, B.C.

Progress was made with the construction of a new airport at Halifax, N.S., during the winter months.

Taxi strip and apron construction work, separate from runway construction, was done at: St. John's, Nfld.; Saint John, N.B.; Forestville, Que.; Malton, Ont.; and Vancouver, B.C.

Surveys were made for future development at several locations for the Civil Aviation, Telecommunications and Meteorological Divisions and also for the Department of National Defence.

Department of National Defence

Runway construction and reconstruction and related development for the Department of National Defence were continued at: Torbay, Nfld.; Summerside, P.E.I.; Dartmouth, N.S.; Chatham, N.B.; Saguenay, Val d'Or and Casey, Que.; Ottawa, Trenton and North Bay, Ont.; Gimli, Portage la Prairie and MacDonald, Man.; Namao, Alta.; Comox, B.C.; and aprons were constructed at Winnipeg, Man.

PLANNING, ERECTION AND MODIFICATION OF BUILDINGS

The construction of terminal buildings was completed at Seven Islands, Que., and Saskatoon, Sask., and alterations were made to terminal buildings at Prince George, B.C. and Whitehorse, Y.T. Contracts were awarded and work started on terminal buildings at Stephenville and Gander, Nfld.; Quebec and Montreal, Que.; Windsor, Ont.; and Comox, B.C.; and for extensions to terminal and customs buildings at Montreal, Que., and Toronto, Ont. Working drawings were prepared for terminal buildings at Torbay, Nfld., and Port Hardy, B.C. A contract for the erection of a control tower at Vancouver, B.C., was awarded.

Construction of dwellings and other living quarters was commenced or completed at Torbay, Nfld.; Goose Bay, Lab.; Canso, N.S.; Mont Joli, Que.; Broadview, Sask.; Cowley, Grande Prairie, Fort Smith, and Empress, Alta.; Smithers, B.C.; Fort Resolution and Coral Harbour, N.W.T.; and Haines Junction, Y.T.

Buildings for instrument landing systems and radio were commenced or completed at Grosse Isle, Magdalene Is.; Port aux Basques, Nfld.; Sydney, N.S.; Richibucto and Moncton, N.B.; Fox River and Montreal, Que.; Ottawa, Almonte, Wiarton, Toronto, and Kleinberg, Ont.; Winnipeg, Man.; Regina, Sask.; Empress, Alta.; Lawn Point, Telkwa, and Victoria, B.C.

Buildings to house airport maintenance equipment, power plants and stores were commenced or completed at Seven Islands and Maniwaki, Que.; Pagwa and Lakehead, Ont.; Regina and Saskatoon, Sask.; Coral Harbour and Hay River, N.W.T.

Meteorological buildings were commenced or completed at Sachs Harbour, Coppermine, Frobisher and Isachsen, N.W.T.

PROVISION OF SERVICES

Power—For Civil Aviation Division, major revisions to the airport power distribution system were completed at Armstrong, Ont.; Hay River, Fort McMurray and Embarras, Alta.; and Fort Simpson, N.W.T.

The power distribution system for the first stage of Gander Townsite development was completed to provide a power supply to 200 housing units. A contract for an additional 200 housing units was awarded and work started.

Major revisions to the power distribution system at Lakehead, Ont., was completed.

Removal of power and communication pole lines across flightways was undertaken at Quebec, Que.; Lakehead, Ont.; Winnipeg, Man.; and Calgary, Alta.

Diesel electric standby plants of 250 kw. capacity were established at Sydney, N.S.; Moncton, N.B.; Windsor and Lakehead, Ont.

For primary power source two 75 kw. diesel electric generating plants were established at Fort McMurray, Alta. A third 1000 kw. diesel electric generating unit was purchased, delivered and partly installed for Gander, Nfld. Also one 125 kw. unit was installed at Sandspit, B.C. Two 75 kw. diesel electric plants were provided for Aklavik, N.W.T., in preparation for the 1957-58 construction programme.

Contracts for new, and extensions to, duct and pulpit systems were awarded for Gander, Nfld.; Summerside, P.E.I.; Mont Joli, Seven Islands, and Montreal, Que.; Ottawa, Ont.; Winnipeg, Man.; and Calgary, Alta.

For Telecommunications Division, construction of a six-mile power line to Terrace, B.C. radio range station was completed.

The establishment of power and control services for eight Omni Ranges was undertaken. The installations were completed at Montreal, Que.; Toronto, London, Stirling and Windsor, Ont. Installations are underway at Wiarton and Kenora, Ont.; and Winnipeg, Man.

The establishment of power services for nine radio beacons were undertaken. The requirements were completed at Wesleyville, Nfld.; Kleinberg, Ont.; Lynn Lake, Man.; Empress, Alta.; and Laberge, Y.T.

Planning only was completed for ten sites for revisions to power and control services for instrument landing systems. Such revisions resulted mainly from runway extensions. Planning was completed for power and control services to three transmitter sites—namely Ottawa, Ont.; Winnipeg, Man.; and Calgary, Alta.

This year, the electrical engineering section undertook the responsibility for the establishment of power services at sites where radio aids to marine navigation are provided. Planning was completed for Belle Isle, Nfld.; Seal Island, N.S.; Richibucto Head and Red Head, N.B.; Fox River and Natashquan, Que.; and Lawn Point, B.C.

Thirty-two diesel electric generating plants ranging from two 20 kw. capacity were purchased and tested. These will ultimately be incorporated as primary power sources or emergency power at various sites established as radio aids for air navigation and radio aids for marine navigation.

For the Meteorological Division, a major power distribution system, together with establishment of three 18 kw. diesel electric generating units, was completed at Banks Island, N.W.T.

Water and Sewer Services—Extensions of and connections to existing water and sewerage facilities were made to service new dwellings, equipment buildings, barracks and other structures.

New water supply systems were provided at Stephenville, Nfld., and Seven Islands and Quebec, Que.

Facilities were provided to convey water from the city of Dorval to Montreal Airport, Que.

Provision of water and sewer services was made at Gander Townsite, Nfld.

AIRPORT AND AIRWAY LIGHTING

The installation of high intensity lighting was completed on one runway each at Gander, Nfld., and Sydney, N.S.; construction was started but not completed on one runway each at Calgary, Alta. and Patricia Bay, B.C. Contracts were let for two similar installations at Winnipeg, Man. and one each at Windsor, London, and Lakehead, Ont.

The establishment of medium intensity lighting was completed on three runways at Dauphin, Man., and on one runway at Rouyn, Que., and Earlton, Ont. Contracts were awarded for medium intensity runway lighting and taxiway lighting at Charlottetown, P.E.I.; Rimouski, Que.; Regina, Sask.; and Grande Prairie, Alta.

The establishment of Department of Transport standard high intensity approach lighting was completed on Approach No. 14 at Gander, Nfld. Contracts were awarded for one similar installation at Gander, Nfld.; Sydney, N.S.; Ottawa, Windsor and Lakehead, Ont.; Winnipeg, Man.; Saskatoon and Regina, Sask.; Calgary, Alta.; and Patricia Bay, B.C.

Contracts were awarded for the installation of a total of eighteen low intensity approach lighting systems at various airports, including Gander, Nfld.; Fredericton and Saint John, N.B.; North Bay and Lakehead, Ont.; Winnipeg, Man.; Saskatoon and Regina, Sask.; Calgary and Fort McMurray, Alta.; and Yellowknife, N.W.T.

Obstruction lighting was established at Sydney, N.S.; Rouyn, Que.; Saskatoon, Sask.; and Calgary, Alta.

Three hazard beacons were established at Penticton, B.C., and commercial power was established for hazard beacons at Quesnel, B.C.

Department of National Defence—One standard RCAF high intensity approach lighting system was completed at one site and contracts were awarded for similar installations at three other sites.

A total of five high intensity runway lighting systems were completed at two sites.

Medium intensity runway and taxiway lighting was established at three airports and contracts awarded for similar installations at three other airports.

PHOTOGRAPHIC REPRODUCTION AND BLUEPRINTS

The Photographic Reproduction Unit is equipped to supply photographic reproductions including enlargements and reductions, blueprints, white and sepia prints, and to provide general photographic service. An example of this general service was the planning and production of teaching aids in the form of greatly enlarged and animated photographs of computers, and other instruments and charts for the Air Traffic Control Schools operated by this Department at Toronto, Ont. and Winnipeg, Man.

This unit serves the Construction Division and, in addition, provides service for the Telecommunications Division, Civil Aviation Division and other units.

Respectfully submitted,

H. J. CONNOLLY,

Chief Construction Engineer.

A/V/M A. DE NIVERVILLE, C.B., LL.D.,
Director of Air Services,
OTTAWA.

METEOROLOGICAL SERVICES

SIR,—I have the honour to submit the annual report of the Meteorological Division for the fiscal year ended March 31, 1956.

The Meteorological Division continued to be responsible for the provision of meteorological services (1) for all civil and military purposes in Canada; (2) for shipping in waters adjacent to Canada and on the Great Lakes; and, (3) for international aviation over the Atlantic, the Pacific and the western portion of the Arctic.

The growth of the Division is indicated by the following:

	March 1955	March 1956
Aviation Forecast Offices	25	33
Dependent Forecast Offices	14	16
Synoptic Stations (surface conditions)	246	250
Radiosonde Stations	33	34
Upper-Wind Stations	70	73
Climatological Stations	1228	1305

FORECAST SERVICES

Forecast services during the year were provided through the following stations:

No. of Stations	Type	Function
12	District Centres	Public and aviation forecast for the District
25	Aviation Forecast Offices	Forecasts for RCAF (in Canada)
4	Aviation Forecast Offices	Forecasts for RCAF (in Europe)
4	Aviation Forecast Offices	Forecasts for RCN
2	Special	Forecasts for Canadian Army at Picton and Camp Shilo
1	Special	Forecasts for D.R.B. establishment at Suffield, Alta.
13	AFO's and City Weather Offices	Special forecasts to public and to aviation

Five new forecast offices were established as follows:

Date	Place
May 1955	Patricia Bay, B.C.
June 1955	Knob Lake, Que.
July 1955	Namao, Alta.
January 1956	Yellowknife, N.W.T.
February 1956	Coral Harbour, N.W.T.

Public Weather Services

Forecasts giving a general description of expected weather conditions for the next two days were issued for 77 inland regions and 20 cities across the country. Marine forecasts covering expected weather conditions over coastal waters and inland lakes were issued for 36 areas three times daily. These forecasts were disseminated by newspapers and broadcasting stations, and were supplemented by forecasts specially prepared to serve agricultural, public utilities, forestry and other interests.

Warnings—Special warning advisory services, in particular regarding late spring and early fall frosts, were continued for the Okanagan, Niagara and Nova Scotia fruit growers. The fruit, vegetable and tobacco growers of the Niagara Peninsula also received special forecasts during the critical growing periods. Timely and effective distribution of these advisories to those concerned was made by radio, press and telephone.

The Severe Weather Warning service was effectively used by district offices during the year. Lives and property were safeguarded through timely warnings, especially in the Prairies where very severe blizzards were experienced. Arrangements to supply weather advice to flood control agencies, particularly in Ontario, were reviewed and revised in the light of experience gained from Hurricane Hazel. Cooperative arrangements were made to speed the distribution of weather advice to Civil Defence units.

Weather Control—Public interest in producing or modifying rainfall by seeding clouds remained high, to judge by the number of inquiries. Scientific advice on the physical processes involved in weather modification was provided on request, together with factual data concerning research projects. Assistance was given in the assessing of evaluation reports where weather modification had been attempted by private contract.

Cooperation with private meteorological firms continued and means were devised whereby the weather information required could best be provided.

Many inquiries were received concerning hail suppression. A proposed cooperative project with the Research Council of Alberta for the study of hail formation was under study.

Weather Programmes—Television continued to be a growing outlet for weather information with 15 stations across Canada carrying regular weather programmes; the press and radio also received weather material and advice in expanded form to meet the increased demand for weather information by readers and listeners.

Public Information—Over 1,300 requests for educational publications were handled at Head Office, in addition to those received at the District Forecast Offices. Staff members delivered 154 addresses on weather topics to service clubs, schools, and industrial groups. Popular articles on weather, written by professional staff, appeared in a total of 85 newspapers, magazines, and periodicals.

Continental Aviation Weather Services

The continued increase in aviation activities in the North, particularly in connection with the DEW Line and Mid-Canada Line, resulted in a heavy demand for weather services. These activities necessitated the establishment of the forecast offices at Yellowknife, Coral Harbour and Knob Lake. The new offices in turn necessitated the extension of the facsimile (map reproduction) and teletype systems over landline facilities in the south and by radio in the north. Weather observing programmes were augmented at several existing stations and many new observing stations were established along the DEW Line.

At the beginning of the fiscal year, meteorological teletype circuits were withdrawn from the DND Aviation Forecast Offices. Since the local meteorologists could no longer prepare their own maps, a wider range of aviation

forecasts had to be made available to these offices for the benefit of RCAF flights. To accomplish this, the times of issue of domestic aviation forecasts were changed and the DND offices were supplied with forecasts covering a greater area than had previously been the case.

The greater utilization of Viscount turbo-jet aircraft by Trans-Canada Air Lines and the extended use to Western Canada of jet aircraft by the RCAF necessitated special meteorological preparations to cope with the greater heights, ranges and speeds of travel.

Revision of all the meteorological examinations for the various categories of civil pilots and navigators was begun during the year. These will be modified gradually over a period of time to make them more practical.

Methods of reporting echoes from weather phenomena (such as precipitation) which have been detected by electronic equipment were developed at a limited number of stations throughout Canada during the year.

No major change in weather reporting procedures were made but a start was made in preparing a new edition of *Manobs*, the Manual of Standard Procedures and Practices for Weather Observing and Reporting.

The introduction of a new career field for Meteorological Assistants resulted in the redrafting of the regulations regarding the suitability of such personnel for employment or promotion.

Trans-Oceanic Aviation Weather Services

International air services inaugurated during the fiscal year, requiring meteorological service from Canadian facilities, included the two CPAL routes, Vancouver to Amsterdam and Toronto to Mexico, and the Guest Airlines route, Windsor to Mexico. These routes gave rise to entirely new requirements for service at Vancouver, Toronto and Windsor. At Vancouver in particular, facsimile (reproduction of weather maps) was found to be essential in meeting the requirement.

The procedures for supplying forecasts for flights from Montreal, Toronto and Windsor to Mexico were revised, in consultation with U.S.A., and Mexican authorities, in the light of an increased number of flights on these routes.

The year saw the spread of international aviation across Canada. By the end of the year, the principal forecast offices at Vancouver, Winnipeg, Toronto, Montreal, Goose and Gander, were regularly providing service to scheduled flights departing on routes terminating as far afield as Asia, Australia, South America and Europe. Other principal forecast offices such as at Edmonton, and aviation forecast offices such as at Churchill and Frobisher, were from time to time called upon to serve international aviation.

The volume of international aviation on existing routes continued to increase, reaching new peaks in 1955-56, with a corresponding increase in meteorological services required.

The growing requirements of international aviation for meteorological service have created a serious problem in the light of the shortage of meteorologists in Canada. National procedures for provision of meteorological services are under constant review to maintain maximum efficiency in line with changing requirements. Internationally, liaison is maintained with the International Civil Aviation Organization, and with meteorological services of other countries, to promote Canadian interests in the establishment of uniform procedures.

Department of National Defence

Forecast Offices were established by the Royal Canadian Navy at Patricia Bay, B.C., and by the RCAF at Namao, Alta. In addition, it was necessary to interchange the RCAF forecast office at Uplands with that operated at Rockcliffe, in order to serve the long-range operations undertaken by the RCAF at Uplands. Three meteorologists were commissioned in the Royal Canadian Navy during the year, two of these to replace the former civilian appointments, the third to fill a new position of Research Meteorologist at Naval Headquarters in Ottawa.

Arrangements were made, for the first time in Canada, to provide full-scale weather services at corps level for a major army exercise. In addition the Staff Meteorologist at Army Headquarters played an increasingly important role as adviser in atomic matters to the Army Staff.

The Met Adviser to the Defence Research Board made a substantial contribution in the application of meteorology to Civil Defence problems in Canada.

The Met Adviser to the Chiefs of Staff was exceedingly active during the year in a wide variety of new meteorological factors arising within the NATO organization.

Forecast Verification

The Verification staff checked for accuracy about 18,000 aviation forecasts which had been issued for Canadian airports during the year. The results were summarized in tables, graphs and charts for the assistance and guidance of the issuing forecast offices. To this work was added the routine checking of more than 7,000 forecasts issued for the general public. Several special verification projects were also completed.

Communications

The meteorological teletype system continued to expand during the fiscal year to a record total of 28,000 miles of circuit with 286 connecting stations. Terminal equipment consisted of 500 teleprinters, 191 transmitter-distributors, 150 perforators, 80 reperforators and 10 switching panels. The following 34 stations were added to the teletype system during this period:

Station	Agency Served	Station	Agency Served	Station	Agency Served
Bagotville.....	TCA	Fort Smith.....	DOT	Montreal.....	WEC
Beaverbank.....	RCAF	Fort Smith.....	RCCS	Namao.....	DOT
Churchill.....	Marconi	Foymount.....	RCAF	Norman Wells.....	DOT
Churchill.....	MCA	Gander.....	RCAF	Norman Wells.....	RCCS
Comox.....	RCAF	Goose.....	RCAF	Patricia Bay.....	DOT
Coral Harbour.....	DOT	Goose.....	USAF	Rocky Mountain House	DOT
Dorval.....	TCA	Holberg.....	RCAF	Sydney.....	RCAF
Dorval.....	WVA	Knob Lake.....	DOT	Terrace.....	DOT
Edmonton.....	PWA	London.....	RCAF	Tofino.....	RCAF
Edmonton.....	USAF	Malton.....	CPAL	Vancouver.....	DOT
Fort Simpson.....	DOT	Moisie.....	RCAF	Yarmouth.....	DOT
Fort Simpson.....	RCCS				

Key TCA—Trans-Canada Air Lines
MCA—Maritime Central Airways
WVA—World Wide Airlines
USAF—United States Air Force
WEC—Weather Engineering of Canada

RCAF—Royal Canadian Air Force
DOT—Department of Transport
PWA—Pacific Western Airlines
RCCS—Royal Canadian Corps of Signals
CPAL—Canadian Pacific Airlines

The Canadian Weatherfax System also continued to expand and at the end of the year reached a total of 13,000 airline miles of circuit with 60 connecting stations. Total terminal equipment consisted of 18 transmitters, 112 recorders, and 8 switching devices for changing from national to regional operation. The following 14 stations were added to the Weatherfax system during this period:

Station	Agency Served	Station	Agency Served	Station	Agency Served
Beaverbank.....	RCAF	Fort Nelson.....	DOT	Patricia Bay.....	DOT
Churchill.....	DOT	Fox.....	DOT	Resolute.....	DOT
Comox.....	RCAF	Gander.....	DOT	Tofino.....	RCAF
Coral Harbour.....	DOT	Knob Lake.....	DOT	Yellowknife.....	DOT
Dartmouth.....	TCA	Namao.....	DOT		

PLANNING AND ADMINISTRATIVE SERVICES

The Stores Depot, which supplied all Air Services Stations in the Toronto District, also provided for the needs of meteorological stations across Canada and for certain Department of National Defence stations overseas. The value of issues from the Stores Depot, consisting mainly of meteorological instruments, equipment, supplies and accessories, totalled \$924,363. The decrease of approximately \$40,000 from the previous year's figure arose from delays in deliveries of radiosonde instruments. Shipments of meteorological maps, facsimile paper and other stationery supplies were valued at approximately \$260,000. The most gratifying achievement of the year was in overcoming to a large extent the problem of packing instruments so as to withstand the rigours of transportation to sites in Northern Canada.

Personnel activities during the year were highlighted by the approval of improved career programmes for Meteorological Officers, Meteorological Assistants and Teletypists Meteorological. Appointments in all classifications during the year totalled 325. Resignations during the same period amounted to 284 resulting in an increase in staff of 41. Included among the appointments were 35 Meteorologists and one Meteorological Officer.

RESEARCH AND TRAINING SERVICES

Research

Research and development work were carried out on the following subjects:

- improvements of procedures for local forecasting
- numerical forecasting of pressure changes and vertical motion
- seasonal maps of upper-winds over Canada
- high-latitude jet streams
- high-level turbulence
- aircraft condensation trails
- aircraft icing
- cloud physics and precipitation processes
- evaluation of cloud seeding
- radiative transfer in the atmosphere
- characteristics of radiation instruments
- monthly maps of average insolation in Canada
- diffusion of particulate matter
- air pollution in the Windsor-Detroit area
- processing of meteorological data for use in ballistics
- energy transformations in the atmosphere

Geophysical Year

A careful study was made of plans for the International Geophysical Year, which will cover the period July 1, 1957 to December 31, 1958, and of the Meteorological Division's participation in this programme. As her contribution, Canada will (1) make regular measurements of atmospheric ozone by means of Dobson spectrophotometers at Alert and Resolute, N.W.T., Edmonton, Alta., and Moosonee, Ont.; (2) carry out special measurements of radiation from the ground and sky at Moosonee and Resolute; (3) use larger balloons in one of the regular daily aerological soundings at seven stations near the meridian of 80°W, in order to reach as high levels as possible; and (4) follow an intensive programme of geophysical observations at Resolute, including the use of a daylight ceilometer and transmissometer to measure cloud height and visibility, frequent snow surveys to assist in estimating ablation, and the continuous recording of the flow of heat through the ground surface, of the intensity of daylight illumination and solar ultraviolet radiation at ground level, and of variations in the vertical of temperature, humidity and wind up to a height of 100 feet. To carry out the above programme the Division will hire temporarily some additional professional staff, particularly physicists.

Technical information or advice was supplied in answer to 101 requests received from within the Division, from government agencies, and from industry. Published papers and technical reports arising out of these requests included a statistical evaluation of the effects of cloud seeding on rainfall in Manitoba and Saskatchewan, a set of maps showing average insolation in Canada, and papers on the forecasting of fog, stratus cloud and cirrus cloud.

Central Analysis

The Central Analysis Office at Dorval, Que., prepared surface map analyses (four times daily) and upper-level map analyses (twice daily), as well as forecast charts for transmission by facsimile to District Forecast Offices and Department of National Defence meteorological establishments. Plans for the extension of the working programme and the output of facsimile charts continued to be hampered by staff shortages. However, revision of certain techniques and procedures made it possible to begin an Operational Development and Evaluation Section on a limited basis, and to begin preliminary work on the techniques of extended forecasting.

Training

Two types of professional training course for meteorologists were provided: an M.A. course given in co-operation with the University of Toronto, and a shorter course for Meteorological Officers, given entirely by the Division. In spite of an intensive recruiting campaign, the supply of recruits was still insufficient to meet the Division's requirements for professional staff.

An M.A. course which ended in May, 1955, was successfully completed by nine students, and two other students graduated in October after supplementary training during the summer. A second M.A. course in progress at the end of the year had twelve students, of whom four had been Meteorological Officers and one had been a Meteorological Assistant. A course for Meteorological Officers was successfully completed by seventeen students, of whom one resigned, two were accepted for the M.A. course, and two others failed to complete successfully the practical training given at Trenton.

A short series of refresher lectures was given to Officers-in-Charge of District Offices.

A three-dimensional analysis of the current weather situation was carried out daily at Headquarters to provide analysed maps for use in the training courses, in weekly map discussions, in research and in liaison with the Central Analysis Office.

Papers

The following papers, which were all published in scientific journals, indicate the scope of the research problems undertaken by the Meteorological staff both at Headquarters and in the field:

PAPER	AUTHOR	PUBLICATION
On the barocline structure of the Westerlies.....	D. P. McIntyre.....	Journal of Meteorology
The computation of infrared transmission by atmospheric water vapour.....	W. L. Godson.....	Journal of Meteorology
Low-temperature fog at the Edmonton Airport as influenced by moisture from the combustion of natural gas.....	G. W. Robertson.....	Quarterly Journal of the R.M.S.
Synoptic evidence for a direct circulation about a jet stream.....	R. Lee.....	Q.J., R.M.S.
An operational frontal contour analysis model.....	E. Anderson, B. W. Boville and D. E. McClellan.....	Q.J., R.M.S.
The storm "Hazel".....	J. L. Knox.....	Bulletin of the A.M.S.
The climate part of the national building code of Canada.....	D. W. Boyd.....	B.A.M.S.
Integrating facsimile into a weather service.....	P. D. McTaggart-Cowan.....	B.A.M.S.
A frontal jet-stream cross-section.....	C. W. Creswick, B. W. Boville, and J. J. Gillis	Tellus
Ramifications of relative humidity in forestry.....	L. B. McHattie.....	Proceedings of the Canadian R.M.S.
Hurricane Hazel.....	C. C. Boughner.....	Weather
Annual variation in pressure and surface winds over the Atlantic between Labrador and Greenland.....	J. G. Potter.....	Transactions of the R.M.S.
Climatic trends along the Atlantic Coast of Canada.....	M. K. Thomas.....	Tr. R.S.C.
A preliminary estimate of average insolation in Canada.....	C. L. Mateer.....	Canadian Journal of Agricultural Science
Annual snowfall in Eastern Canada.....	J. G. Potter.....	Proceedings of the Eastern Snow Conference, Burlington, Vt.
A method for determining winter design temperatures.....	M. K. Thomas.....	Air Conditioning, Heating and Ventilating
Climate and building.....	M. K. Thomas.....	Proceedings of Conf. on Bldg. Research, Ottawa, Ont. 1953
Climate in relation to frost action.....	C. D. Crawford and D. W. Boyd.....	Highway Research Board Bulletin

Circulars

Nineteen technical circulars, describing investigations carried out by Meteorological Division staff or summarizing new developments in meteorology were issued during the year. The subjects dealt with included:

SUBJECT	AUTHOR
An analysis of Experimental Outlooks issued by the Halifax Public Weather Office, November 1952 to November 1953.....	R. E. Munn
A study of horizontal temperature variations in the Winnipeg area on nights favouring radiational cooling.....	E. Einarsson and A. B. Lowe
Report on evaluation of cloud-seeding operations in Manitoba and Saskatchewan...	W. L. Godson
Lightning fires over southeastern British Columbia.....	J. A. Turner
Some aspects of the climatology of southwestern British Columbia Coast.....	K. F. Harry
Formation, properties and forecast of Arctic Sea ice.....	M. G. Hagglund
Stratus forecasting.....	R. Lee
An investigation of vertical and slant visibility in snow.....	W. D. Murden
The effect of wind on subsurface water temperatures in Thunder Bay.....	E. Einarsson
The influence of topography on the surface winds at Rivers, Manitoba.....	U. Sporns
Monthly sea-level pressure maps for Canada.....	J. G. Potter
An investigation of unusually strong low-level winds over Halifax, May 19, 1955....	R. Lee
Fog forecasting.....	R. Lee
The distribution of cirriform clouds.....	J. Clodman
Heavy snowfalls at Campbellton, N.B., December—March 1954-55.....	R. V. Dexter
The Canadian Meteorological programme for the International Geophysical Year..	W. L. Godson and C. L. Mateer
The estimation of 1000-500 mb thicknesses.....	H. P. Wilson

INSTRUMENT SERVICES

Both the quantity and the variety of instrument procurement reached a new high during the fiscal year, as new instruments and raw materials from which instruments could be manufactured were purchased in record volume. Shipments of instruments from Toronto to the field totalled 1,576, approximately 10 per cent higher than the figure the previous year. The shipments varied all the way from a simple rain-gauge worth a few dollars to the shipment of a complete station weather-reporting outfit which would be valued in thousands of dollars. For example, complete outfits for about a dozen DEW Line stations were shipped during the year, so that the size of the average shipment from Toronto increased markedly. The Armed Services and the DEW Line were largely responsible for the above increases.

Instrument Shop

The Instrument Shop had a record production in line with the increase in instrument shipments. The shop produced 1,891 major instruments or instrument components including:

60 sets of control tower type of wind equipment	100 motor psychrometers 100 instrument blocks
28 barographs	62 ceiling projectors
15 special mercury barometers	

Work on experimental models and prototypes of new instruments was also part of the function of the shop. A good start was made on the construction of a primary standard barometer for Canada. This instrument will eventually replace two present barometers which are used as a standard for all Canadian pressure observations, and will be more accurate than either. Work was begun on a quantity of the new type of Canadian radiosonde recorders which will ultimately be used in the new Canadian-designed radiosonde.

The Radiosonde Laboratory

The Radiosonde Laboratory calibrated 4,944 radiosondes, 1,183 liquid-in-glass thermometers, 100 electric thermometers, 16 thermographs, 200 precipitation graduates, as well as a number of special instruments, such as hygrometers. Materials such as ink, oils and plastics were given low temperature and other tests during the year to ensure that they would meet the standards required for northern stations. Two hundred new radiosonde transmitters were constructed as well as several hundred battery adaptors; both parts are to be used in the new Canadian radiosonde. Development work on the radiosonde equipment continued. The decrease in the number of radiosonde calibrations during the year is due to the predicted change-over to the Canadian instruments in the autumn of 1956.

Electronics Laboratory

The Electronics Laboratory constructed three special wiresondes for use on HMCS *Labrador*. This Lab also assisted in the development of the transmitters for the Canadian radiosonde, parts being purchased for the construction of 200 of these instruments for test purposes. A series of 12 test runs were made with the Canadian and U.S. radiosondes to compare the performance of these two instruments, especially at high levels.

The final development of the new Canadian radiosonde was completed during the year and as noted above the instrument will, it is hoped, be in production in the fall of 1956.

An electronic transmissometer and ceilometer were received during the year and tested in the Laboratory. It is proposed to install the instruments at Malton Airport for trial.

CLIMATOLOGICAL SERVICES

The Climatological Service continued to expand its activities during the year in response to increased demands for climatological data from industry, business, governmental organizations and the general public. The network of climatological stations was expanded, improved methods of eliminating errors were applied to the processing of weather reports, the regular publications were issued and a record number of individual requests for information were handled.

Observing Network

At the conclusion of the fiscal year there were 1,551 official weather reporting stations in Canada, an increase of 101 stations over the previous year. From these stations 260,000 completed report forms were received. Details are given in the following table:

Station Classification	Number of Stations	
	1954-55	1955-56
Synoptic—hourly reports.....	132	162
Synoptic—3 and 6 hourly reports.....	90	88
Climatological—temperatures and precipitation.....	842	856
Climatological—precipitation only.....	386	449
Total surface-weather stations.....	1,450	1,555
Radiosonde, including upper-winds.....	33	34
Upper-winds only.....	37	39
Total upper-air stations.....	70	73

Punch-card System

Data from the climatological stations were processed by hand, but data from the synoptic stations were processed by machine. Beginning in July 1955 a new programme of transferring current upper-wind and radiosonde observations to punched cards was begun.

During the year 2,960,000 cards were punched, edited and reviewed. Of this number 160,000 cards were prepared in 18 field offices; toward the end of the year hand punches were distributed to an additional 40 field stations. By March 31, 1956, the punched card library held 7,800,000 cards. Work continued as well in transferring to punch cards the hourly reports, synoptic surface-weather reports and upper-air reports from previous years.

Publications

Monthly weather data were collected from 41 selected Canadian weather stations at the close of each month for the international "Climat" broadcast which is sponsored by the World Meteorological Organization. *Climat Maps* of temperature, precipitation, and pressure were issued within a few days of the close of each month and transmitted over the national facsimile circuit.

The *Monthly Weather Map* was issued for each month. Final manuscripts were prepared for eleven issues of the 1953 and 1954 *Monthly Record of Meteorological Observations in Canada*. Work on the 1955 and 1956 issues of this publication was begun using a combination of clerical and machine listings. The 1954 issue of the *General Summaries of Hourly Weather Observations in Canada*, the first of that series to be prepared from machine listings, was published. By the end of the year most of the preliminary work had been completed for the 1955 issue. Other regular climatological publications issued by the Division during the year included *Monthly Meteorological Summaries* (for 20 localities), *Annual Meteorological Summaries* (for 10 localities), the monthly summary of *Degree Days*, and the weekly *Weather Summary for the Prairie Provinces*. A new publication *Snow Cover Data—Eastern Canada* was begun with the issue during the year of data for the winter of 1954-55.

Final manuscripts were sent to the printer for Volume III of *Climatic Summaries for Selected Meteorological Stations in Canada*. This summary, entitled *Frost Data*, was to be published in May 1956. The first of a series of

regional climatic studies, *The Climate of Central Canada*, was published at the close of the year. Final drafts were completed for the 55 climatic charts that will be published in the *Atlas of Canada*. Several papers and research studies dealing with Canadian climate were prepared and published during the year. These included studies on: (1) climate in relation to frost action; (2) monthly mean sea-level pressure maps for Canada; (3) variations in pressure, wind and temperature along the Atlantic Coast; and (4) variability and trends of precipitation in the Prairie Provinces.

Inquiries

Some 2,000 letters were written in response to individual requests for climatological information and advice, and in addition more than 1,000 outside telephone calls seeking data and advice were handled. In answer to requests from the Department of National Defence, the Civil Aviation Division and other governmental organizations, major studies were undertaken during the year on (1) freezing precipitation, (2) temperatures for heating design, (3) growing degree-days, and (4) climatic trends. Special data compilations were made during the year for the following governmental publications: *Navigation Conditions on the Hudson Bay Route from the Atlantic Seaboard to the Port of Churchill*; the *Climate of British Columbia*; *Agricultural Statistics for Ontario*; *Statistical Year Book of the Province of Quebec*; *Canada 1955*; and the *Canada Year Book*.

BASIC WEATHER SERVICES

Basic Weather Services provide the fundamental meteorological observational material from a network of surface, upper-air and marine stations, from the Arctic to temperate latitudes. The isolated nature of many of the stations, associated with difficulties of staffing, transportation and systematic communications, complicates the problem of maintaining consistent and accurate observations so necessary to a physical science.

The inspection programme maintains the uniformity in method of observations in accordance with WMO procedures.

Surface

Daily weather reports were received from 250 synoptic and hourly observing stations (excluding DEW Line stations) of which 73 were upper-wind stations. In addition weather reports for special purposes such as forestry and public weather were received from 33 other stations. Hourly reports were also received from a number of DEW Line sites. Reports are now received from new stations at Timmins, Ont., Gretna, Man., Edmonton (Namao), Alta., and Snare River, N.W.T. The station at Pickle Lake was reopened with Ontario Forestry personnel as observers. Synoptic stations at Porquis Junction, Ont., Telegraph Creek, B.C., and Ferguson Lake, N.W.T., were closed during the year, Porquis Junction being replaced by Timmins, and climatological observations being continued at Telegraph Creek.

The Meteorological Inspectors carried out 320 complete inspections of meteorological stations and made some 200 special trips to install, service, repair or replace specific instruments.

Marine

Ocean-going merchant ships, voluntarily observing weather under the supervision of the Meteorological Division, increased to 45. In addition 13 ships operating on the Great Lakes were equipped with anemometers and reported weather regularly during the shipping season. Port Meteorological

Officers at Halifax, Saint John, and Vancouver made a total of 620 visits for supervision of the weather programme on ships. At headquarters a programme has been developed for assessing the accuracy and completeness of the observations from ships and this information is discussed with the ships' officers by the Port Meteorological Officers.

Upper-Air

Thirty-one regular upper-air stations were in operation of which twenty-seven are now reporting upper winds by rawinsonde. The Pacific weather ships observe upper-winds by radar and the remaining three stations, i.e. Arctic Bay, Coppermine and Aklavik, are radiosonde stations reporting upper-air temperatures, pressures and humidities. Expansion from radiosonde to rawinsonde was completed at Fort Nelson, The Pas and Nitchequon, leaving only two more stations, i.e. Coppermine and Aklavik, to convert under the original plan.

Unscheduled upper-air observations were carried out at three additional stations located at Nicolet, Que., Toronto Island, Ont., and Cold Lake, Alta. Observations at Cold Lake and Nicolet are required for special projects undertaken by the Department of National Defence.

The weatherships C.G.S. *St. Catharines* and C.G.S. *Stonetown* successfully manned the Pacific weather station "Papa" (50°N; 145°W) with each ship remaining on station for six weeks before returning to port. The C.G.S. *Stonetown* had occasion to rush to the rescue of the freighter *Washington Mail* which foundered after breaking up in a storm. Fortunately another vessel was on hand to pick up the survivors and the weathership was able to resume its weather patrol activity with a minimum of interruption.

Considerable work was undertaken in an effort to achieve higher altitudes in the upper-air ascents in order to meet the increasing requirements of aviation. Balloons and batteries for powering the radiosonde transmitters are the two components which affect to the greatest extent the height of an individual sounding. Balloons are now available in convenient size to enable the instrument to attain an altitude of 90,000 feet regularly.

Arctic

The five Joint Arctic Weather Stations in the Queen Elizabeth Islands, (Resolute, Mould Bay, Isachsen, Eureka and Alert), which are operated jointly by Canada and the United States, continued to supply surface and upper-air weather information and also served as advanced bases to support scientific expeditions, the largest of which was the geological survey, Expedition Franklin. Special scientific projects carried out by the weather station staffs were: permafrost temperature measurements to a depth of 650 feet at Resolute; tidal observations; snow temperature and profile observations and snow trafficability tests; sea ice thickness measurements; sea ice temperature variation with depth measurements at Eureka; plant growth experiments.

A new surface and upper-air observing station was established at Sachs Harbour, Banks Island, latitude 72° 31'N, longitude 124°W., making it the most westerly station in the Arctic Archipelago. Supplies were transported to Sachs Harbour by Hudson Bay vessel operating from Tuktoyaktuk and the first cargo was landed on the beach August 13, 1955. Though hampered at the outset by a severe storm which scattered supplies for several miles along the shore and caused damage especially to electrical equipment, the staff, which had been carefully selected, set to with a will and by November 1, 1955, commenced

regular observations. A full surface weather and upper-air observation programme has been continued since that date. A post office was established. The RCAF delivered certain essential equipment and mail to the satellites and to Sachs Harbour by airdrop.

Difficult ice conditions were encountered during the summer sea supply in 1955 with the ships, in consequence, reaching Resolute later than usual. As ships were unable to reach either Eureka or Alert, a major airlift had to be carried out to both stations. Fall and spring resupply to Mould Bay and Isachsen was carried out by the RCAF, who received meteorological briefing and weather reports at Resolute. The resupply of Alert and Eureka was carried out by the U.S.A.F. operating from Thule, and the RCAF from Resolute.

The work of enlarging and improving the airstrips at the satellites was continued with the goal of providing usable strips to meet RCAF requirements for the spring and fall airlifts, and also to provide strips for emergency landings.

Arrangements were completed for the printing of the Climatological Summaries for Alert covering the period from commencement of observations in June, 1950, to the end of 1953.

As the Joint Arctic Weather Stations are an international undertaking with numerous departments and agencies interested in them, one main conference and several subsidiary meetings to effect coordination were held during the year.

INTERNATIONAL CO-OPERATION

The demands on the senior staff in international meteorology steadily increased in 1955-56, arising in part from Canada's geographical position on the polar aviation route, in part from Canada's appreciation of the operational difficulties in meteorology of small nations, and in part from the responsibility of the Controller as President of Regional Association IV (North and Central America). Sixteen members of the staff participated in technical commissions or working groups of the WMO, ICAO or NATO meteorological organizations. In addition to taking part in the international meetings given below, the staff provided several hundred working documents, reports and statements to the above international organizations.

Because aircraft are flying at greater heights and making longer flights than previously, the demands of aircraft operators for meteorological information have changed significantly. ICAO meetings have provided an appropriate forum for considering how best the requirements of the various parties can be provided. Among the items of meteorological interest at the Second ICAO Air Navigation Conference were:

1. Meteorological reports for take-off, approach and landing;
2. Forecasting runway visual range;
3. Climatological studies of air routes and airports.

The First Pacific Regional Air Navigation Meeting discussed:

1. The requirements for sending hourly weather reports across the Pacific;
2. Transit time for weather transmissions;
3. Pacific Ocean weather ships;
4. Procedures for inflight reports; responsibilities of aircraft dispatchers versus flight watch.

International meteorological activities in 1955-56 were unusually extensive owing to the Second Session of the Congress of the World Meteorological Organization in April-May, 1955. Canada was one of the 83 nations and territories which participated in the Second Session, held in the Palais des Nations, Geneva, Switzerland.

The Second Congress approved a carefully prepared Codex of WMO Technical Regulations which contains both the mandatory and the recommended practices and procedures applicable to meteorological services of all nations. The section of the Regulations on Aviation Meteorology was developed jointly with ICAO and came into force on January 1, 1956; the remainder of the Regulations will become effective on July 1, 1956.

The Second Congress authorized an agreement with the United Nations Technical Assistance Authority whereby the WMO will be responsible for providing aid in meteorology to under-developed nations which request it.

The scientific programme outlined by Congress for the following four years included the completion of the International Cloud Atlas, the preparation of specifications for climate atlases and plans for international meteorological tables, a bibliography of meteorological publications and a film library. The Executive also considered technical questions such as securing uniform international procedure for reporting visibility and wind velocities.

The Seventh Session of the Executive Committee, which was held immediately after Congress, was largely devoted to arrangements for the International Geophysical Year, the participation of the WMO in the Technical Assistance Programme of United Nations, and the award to an individual of an annual prize for outstanding work in meteorology.

The Fourth Conference of Commonwealth Meteorologists was attended by Directors from 17 independent Meteorological Services inside the British Commonwealth, in addition to senior members of the United Kingdom Meteorological Office. The programme covered a wide range of subjects including the following:

1. Dissemination of information on researches in progress;
2. Establishment of a Meteorological Research Institute to the tropics;
3. Preparations for the International Geophysical Year;
4. Bulk orders of meteorological instruments;
5. Status of weather forecasting by numerical procedures and of artificial control of rain;
6. Recruiting of ships for weather reports.

Representatives of the Meteorological Division participated in the following meetings:

(1) World Meteorological Organization

- (a) Congress—The Second Congress, Geneva, Switzerland, April 14 to May 13, 1955. (3 delegates).
- (b) Executive Committee—Sixth Session of the Executive Committee, Geneva, Switzerland, April 12-18, 1955. (3 delegates).
Seventh Session Executive Committee, Geneva, Switzerland, May 13-17, 1955. (1 delegate).
- (c) Caribbean Hurricane Seminar, February 16-25, 1956, Ciudad Trujillo, Dominican Republic. (1 delegate).

(2) International Civil Aviation Organization

- (a) Second Air Navigation Conference, August 30 to September 27, 1955, Montreal. (2 delegates).
- (b) First Pacific Regional Air Navigation meeting, Manila, Philippines, October 27 to November 25, 1955. (1 delegate).
- (c) Special North Atlantic Regional Air Navigation Meeting, February 18 to March 4, 1956, Paris, France. (1 delegate).

(3) Commonwealth Meetings

- (a) Fourth Conference of Commonwealth Meteorologists, London, England, May 23-26, 1955. (1 delegate).

(4) North Atlantic Treaty Organization

- (a) Twelfth Meeting of the Standing Group Meteorological Committee held at Paris, June 21-24, 1955. (1 delegate).
- (b) Third Meeting of the Standing Group Meteorological Committee Working Group on Weather Plans, London, January 10-13, 1956. (1 delegate).
- (c) Third Meeting Standing Group Meteorological Committee Working Group on Weather Communications, London, January 16-18, 1956. (1 delegate).
- (d) Seventh and Eighth Meetings of the Canadian—United States Regional Planning Group Meteorological Committee, Washington, May 25-27, 1955 and Ottawa November 29-30, 1955. (1 delegate).

The above report is respectfully submitted.

ANDREW THOMSON,
Controller of Meteorology.

A/V/M A. DE NIVERVILLE, C.B., LL.D.,
Director of Air Services,
OTTAWA.

TELECOMMUNICATIONS DIVISION

SIR,—I have the honour to submit the report of the Telecommunications Division of the Department of Transport for the fiscal year ended March 31, 1956.

The activities of the Telecommunications Division may be summarized as follows:

(1) The administration of national and international radio laws, regulations and agreements involving the management of the Radio Frequency Spectrum through adoption of standards for equipment, licensing of radio stations, and enforcement of laws and regulations affecting operation of radio stations and use of radio for safety of life in the air and on the seas.

(2) Construction, maintenance and operation of Aeronautical, Marine and Meteorological Radiocommunication Stations and of radio aids to air navigation associated with airports and domestic and international airways, and radio aids to marine navigation along the sea coasts of Canada and on the Great Lakes.

(3) Administration of national and international telegraph regulations and agreements; accounting for aeronautical, marine and point-to-point domestic and international traffic; the construction, maintenance and operation of the Government Telegraph and Telephone Service; administration of the Northwest Communication System and Landline Services of the Department.

INTERNATIONAL CONFERENCES

The International Telecommunication Union (I.T.U.) Administrative Council held its annual session in Geneva during May, and Canada, as one of the eighteen member countries, was represented by an official of the Telecommunications Division. The Council took decisions on many matters relating to international telecommunication services, including the continued implementation of frequency allotment plans affecting radio services on a world-wide basis.

RADIO REGULATORY SERVICE

All radio regulatory services are combined under the direction of the Superintendent of Radio Regulations. The regulatory functions are sub-divided as follows:

- (1) Radio Frequency Allocations and Licensing
- (2) Inspection and Examinations—including all matters of enforcement and personnel qualifications
- (3) Radio Regulations Engineering—concerned with the technical aspect of radio regulation.

Number of Radio Stations in Canada

The number of radio stations in operation in Canada during the fiscal year 1955-56 was approximately 43,100. This figure includes stations operated by Departments of the Federal, Provincial and Municipal Governments, stations on ships and aircraft registered in Canada, also mobile stations operating in the public and private land mobile services. This represents a net increase of approximately 1,700 stations over the previous year.

Regulation of Radio Services Operated by Federal Government Departments and Provincial Governments

The Department of Transport is concerned with the regulation of the radio services of other government departments, both Federal and Provincial, with special reference to the assignment of suitable frequencies. Many of these services are operated by the Department of National Defence. The number of stations operated by these departments is now 5,112, an increase of ten per cent during the past year, exclusive of military services.

The installation of radar defence systems for military purposes required the licensing of a considerable number of radio stations for navigational and communication purposes during the construction phase.

Principal Licensed Common Carrier Radio Services

The Canadian Overseas Telecommunication Corporation and the Eastern Telephone and Telegraph Company commenced construction of a micro-wave radio relay system between Sydney Mines, N.S., and the U.S.-Canadian border, as a segment of the Trans-Atlantic Telephone Cable. These companies were granted Experimental Station licences authorizing the conducting of tests of the radio equipment to be installed for the provision of the commercial cable service. The C.O.T.C. will provide a common carrier service, including TV programme relay, over a portion of this system to meet the requirements for domestic service in the area. In this regard the New Brunswick Telephone Company and the Maritime Telephone and Telegraph Company were licensed to conduct tests with a view to the construction of micro-wave Spur Radio Circuits.

The Canadian Overseas Telecommunication Corporation concluded tests and commenced construction of a station at Vancouver to provide a direct radiocommunication service with Australia.

An extensive expansion in all categories of radiocommunication service has taken place. This is reflected in the increased services provided by common carrier communication companies, including:—

- (a) the reorganization of existing radio terminals and the establishment of additional terminals to improve and extend the land mobile and point-to-point radiocommunication services in the British Columbia area;
- (b) the establishment of additional stations in the three Prairie Provinces to improve and extend land mobile and point-to-point radiocommunication services;
- (c) the extension northward of existing land mobile radio services in Ontario and Quebec and the establishment of additional point-to-point radiocommunication services in these Provinces and Labrador to provide outlets for isolated and semi-isolated areas;
- (d) the modification of existing radiocommunication systems and installation of additional stations in the Maritime Provinces to provide better coverage and increased capacity;
- (e) the continued growth in the use of radio for TV broadcast remote pickup and studio/transmitter links;
- (f) the change in the Trans-Canada Micro-wave System from the site selection to the construction phase, including the establishment of Spur Circuits.

Further submissions relative to the establishment of a Restricted Common Carrier land mobile service were studied. It is expected that this type of service will extend the advantages of radiocommunication to organizations which are not in a position at the present time to obtain licences for their own private systems.

Other Radio Services

Increased activity in the Civil Defence field resulted in a number of provincial and municipal government departments being granted licences for Civil Defence communications.

Apart from the normal increase in the use of radio for communication services in remote areas, the majority of the additional licences granted were to provincial government departments and power commissions, municipal departments, power companies, and private land mobile services including those for the heavy construction industry. More and more radio equipment is being licensed for use for forest protection and products communication.

There was a marked increase in the number of mobile radio units in use, including those in small vessels and land vehicles.

The number of licensed Community TV receiving Antenna Systems increased sharply during the year. Such systems, licensed as Commercial Broadcasting Receiving stations, consist of efficient antennae, amplifiers and co-axial cable distribution systems and serve large numbers of subscribers mainly in areas of fringe TV reception.

Though the Department expanded its aids to air navigation facilities, nevertheless it was necessary to license aviation companies to establish more of their own aeronautical navigational aids and communication facilities in remote areas.

Safety Radio Surveys and Inspections

The radio inspection organization of the Division operating through 25 District Offices across Canada inspected 9,500 radio stations of all classes. Included in these inspections were approximately 108 surveys of Canadian and foreign ships pursuant to the terms of the Safety of Life at Sea Convention, 1948, and the radio provisions of the Canada Shipping Act.

As a result of these surveys over 100 Safety Radiotelegraphy and Radiotelephony Certificates were issued to cargo ships and six reports made to the Chairman of the Board of Steamship Inspection supporting the issue of Safety Certificates to passenger vessels. In addition, 13 Safety Convention Radio Exemption Certificates were issued to ships.

The Agreement for the Promotion of Safety on the Great Lakes by means of Radio, which was concluded between Canada and the United States of America, came into force on November 13, 1954, but the compulsory carrying of inspection certificates pursuant to the Agreement was postponed for a period of 12 months to enable ships to comply.

Because of serious congestion on the medium frequencies used in the maritime mobile service, steps are being taken to promote the adoption of improved equipment over a five-year period and to encourage the use of very high frequencies (VHF) for short range communication in this service.

During the fiscal year 634 inspections and surveys were made of Canadian radio equipped aircraft. The majority of these involved comprehensive surveys with stringent tests to determine whether installation and functional

standards had been met, and whether the apparatus was capable of continued operation at a high degree of efficiency under exacting in-flight conditions and in conformity with safety requirements established by the Telecommunications Division in co-operation with the Chief Aeronautical Engineer.

The growth in use of radio apparatus in aircraft was evidenced by the fact that some 320 sets of engineering drawings of proposed installations were examined by the inspections service. Many such drawings covering proposed modifications to radio installations in aircraft were also examined and approved during the year.

The inspections service carried out surveys and made recommendations respecting applications for Operating Certificates submitted by Canadian air carrier organizations, including those involving overseas routes.

Inspectors maintained close liaison with manufacturers and distributors of aviation radio apparatus as well as aircraft overhaul and maintenance organizations, to ensure compliance with Telecommunications Division standards in all cases.

In-flight surveys of North Atlantic air carrier routes were made during the year for the purpose of evaluating the communications facilities provided for use by Canadian aircraft operating to the United Kingdom and European points and assessing the effectiveness of equipment on the aircraft and procedures used.

Examination for Certificates of Proficiency in Radio

Qualified operators are required on all classes of stations in order that the technical requirements prescribed under international agreement will be closely observed. Such operators are particularly essential in the case of stations of the maritime and aeronautical services in the interests of safety of life.

The more important services call for operators holding first, second or other prescribed class of Certificate of Proficiency, while in the case of services of lesser importance, not likely to become a source of interference, operators are required only to satisfy the Department that they are fully qualified to operate and maintain the equipment upon which they are employed.

During the current year 1,814 examinations were conducted which resulted in the issuance of 1,650 new certificates.

As of March 31, 1956, the total number of certificates issued was 27,921 but not all of these are still valid. In the professional classes, certificates must be brought up to date from time to time by exchange or by re-examination, and in a number of cases operators have allowed their certificates to become obsolete.

Broadcasting

During the year the Canadian Broadcasting Corporation placed into operation the French language television station CBOFT, Ottawa, Ont., on Channel nine. With the seven television stations which were placed into operation prior to 1955-56 the Canadian Broadcasting Corporation has completed six English language and two French language television stations as envisaged by the existing Government policy on television coverage.

Six private commercial broadcasting stations (television) commenced operation during the year in accordance with the Government television coverage policy.

The Department received nine applications for new private commercial broadcasting stations (television). Six new private commercial broadcasting stations (television) were authorized. Twelve applications were received and processed for changes in facilities of already authorized private commercial broadcasting stations (television).

The Department received and processed 12 applications for new amplitude modulated sound private commercial broadcasting stations and 111 applications from existing private commercial broadcasting sound stations, nine for changes in facilities, 91 for transfer of shares and 11 for other broadcasting facilities which included broadcast pick-up units and standby transmitters.

The Department received and processed one application for a new frequency modulated private commercial broadcasting station and one application for a change in facilities from an existing frequency modulated private commercial broadcasting station.

As a result of the above applications, nine amplitude modulation notification lists were prepared and forwarded to the Inter-American Radio Office in Cuba for distribution to the signatory countries of the North American Regional Broadcasting Agreement. These notification lists comprised a total of 60 individual notifications, nine of which were changes in existing facilities and 11 were for new assignments. There were 18 television station notifications, six of which were for new stations and eight were revisions, which were prepared and forwarded to the Federal Communications Commission of the United States.

During the year 24 applications for unattended operation of broadcasting stations using supervisory control systems were received and approved by the Department.

Radio Spectrum Conservation

Numerous demands continue to be made for radio frequency assignments for all types of radio communication services. The radio spectrum is a limited resource and if Canada's radio communication requirements are to be met, a strict programme of spectrum conservation is necessary. With this in view, the Department extended greatly the establishment of more rigid standards covering the technical suitability of radio equipment for licensing in Canada.

The object of these standards is to improve the performance of radio equipment licensed in Canada, so that more frequencies may be assigned for communications in any given band with less interference to existing radio services. These standards are being developed in very close collaboration with the Canadian Radio Technical Planning Board which represents the users and manufacturers of radio equipment in Canada.

Monitoring Stations

The Department operated monitoring stations at Hartlen Point, N.S., Ottawa and Strathburn, Ont., Winnipeg, Man., Wetaskiwin, Alta. and Vancouver, B.C., to ensure that Canadian radio stations are operated in accordance with the Radio Act and Regulations, Regulations of the International Telecommunications Union and other applicable domestic and international radio regulations. They also check the radio spectrum for channel occupancy, for unidentified or illegal radio stations and assist in the solution of problems of interference of other stations with Canadian stations.

In the spring of 1955 a new monitoring station was commissioned at Beaumont, Que., to cover radio stations in the lower St. Lawrence River area. Because interference in the Ottawa area has been making the operation of the Ottawa Monitoring Station increasingly difficult, construction work was started in the fall on a new station near Almonte, Ont.

Development work was also started on a mobile monitoring station to cover those stations using line-of-sight propagation such as television, microwave and radar stations.

Suppression of Inductive Interference

Fifty-six cars are equipped for the investigation of interference and operate from the permanent inspections offices located in 25 cities throughout Canada. The inspectors in these cars investigate reported cases of interference throughout their districts, and monitor receiving conditions during routine patrols. Owners of the offending equipment are advised how to suppress the interference and, where necessary, appropriate tests are conducted.

During the year, 11,501 sources of interference were located, and suppression obtained in all but a few cases having no economic cure. Approximately 60 per cent of the sources were located in connection with complaints of interference to Standard Broadcast reception, and 40 per cent in connection with complaints of interference to television reception.

Due to the expansion of television service in Canada, the number of reports from the public of interference to television reception has increased very greatly. The increased use of television receivers also has created an additional problem, as many of these sets radiate sufficiently to affect nearby radio broadcast receivers. Agreement was reached with the Radio-Electronics-Television Manufacturers Association of Canada that its members would suppress all television receivers manufactured in 1956 to a conducted noise level of 200 microvolts and those manufactured in 1957 to a further degree. While complete suppression is very difficult to achieve, it is expected that the agreed degree of suppression will largely eliminate interference to normal strength signals.

The work of investigating and suppressing interference to television reception has continued and special investigations have led to improved techniques in the location of sources and means of suppressing interference, particularly from abnormal conditions on power lines and electrical equipment. Extensive studies and measurements were carried out during the year, particularly on the suppression of electric warming pads and motor-driven household appliances, and real advances were made in the technique of suppressing such equipment.

New equipment for the investigation of interference to very high frequency communications, including television, has been installed in a number of the cars, and the work of fitting the remaining cars with thoroughly up-to-date equipment is proceeding rapidly. During the year our investigators were also supplied with improved types of suppressors. These are used to determine the best means of suppressing a source after it has been located.

The interference section continues to co-operate with the Canadian Standards Association in the preparation of standards of good engineering practice with regard to the prevention of interference. Standards for colour television receiver interference are under study.

RADIO AIDS TO NAVIGATION AND RADIO COMMUNICATION STATIONS

During the year arrangements were made for the integration of marine radio and aviation radio stations under a common jurisdiction in each district. This makes it easier to deal with matters common to both types of station and paves the way for combining the two functions in a single establishment at certain locations.

MARINE

A review of the status of Marine Radio stations was made and, though no new stations were commissioned, considerable planning was undertaken for the combining of marine and aviation facilities where this was desirable, and the expansion and renovation of existing facilities.

Radiobeacons—Lightkeepers have now been trained to operate radio-beacons as well as the lighthouse equipment, and have replaced radio operators at most radiobeacon stations.

Lighthouse Radiophones—As a result of radio operators being superseded by lightkeepers who are not able to use radiotelegraph equipment, it has been necessary to provide radiotelephone communications as a replacement. In other cases, due to re-arrangement of the network, higher power was provided to ensure adequate communications with the appointed control station.

Direction Finding Stations—The direction finding service at the Pachena, B.C., station was discontinued during the year. However, the East Coast and Hudson Bay direction finding stations continued to perform a useful service, particularly those on the Hudson Bay route where magnetic compasses are unreliable.

AVIATION

Four course radio ranges—The Pennfield Ridge, N.B., radio range was re-commissioned in May, 1955, as an unattended facility to provide definite track guidance in the vicinity of Camp Gagetown, and a radio range was established at Terrace, B.C.

Very High Frequency Omni-ranges—Six installations—at Montreal, Ottawa, Stirling, Toronto, London and Windsor—were commissioned to provide omni-range facilities on the Montreal-Windsor airway, and work progressed on further installations for a high altitude airway between Toronto and Winnipeg, and for an isolated station at Gander.

Aeronautical Radiobeacons—New radiobeacons were provided at Kleinburg, Ont., Lynn Lake, Man., Empress, Alta., Terrace, B.C., and Kitimat, B.C., where they constitute major air navigation aids, while other non directional beacons were established as additional aids in connection with radio range courses as follows: three at Edmonton and one each at North Bay, Calgary and Smithers.

Instrument Landing Systems—A new Instrument Landing System was established at Regina, Sask. In addition, work progressed on two non directional beacons and 75 Mc/s markers at Toronto and Winnipeg and one each at Sydney, Moncton and Ottawa on the back beams of the systems, to assist approaches to the field under instrument flying conditions.

Aeronautical Communications Stations—Increased demands for service necessitated the expansion of existing facilities, including the provision of additional equipment where necessary. To meet the need for improved

accommodation, brought about by expansion, a new transmitter building was erected at Gander during the year and plans were made for a new signals centre and tape relay system. At Goose, work proceeded on a similar project. An international air-ground communication station is being established at Resolute to provide communications with aircraft flying the so-called "polar routes" between Europe and either the west coast of Canada or Alaska. Point-to-point communication circuits are also being established to provide fixed communications with this aeronautical communication station.

Weather Reporting Stations—Further work was accomplished in connection with the rebuilding of Coppermine, N.W.T., and the Brochet, Man., station was taken over from the Royal Canadian Corps of Signals.

Radio Facsimile—The radio part of the facsimile service was expanded by the addition of receiving equipment and recorders at Goose, Gander and Frobisher. The Edmonton transmitters were commissioned, and Fort Nelson, B.C., Churchill, Man., Resolute, N.W.T., Coral Harbour, N.W.T., and Yellowknife, N.W.T., were equipped to receive these transmissions.

Ground Controlled Approach—Work progressed during the year on a system of ground controlled approach for Gander, consisting of a surveillance radar with a range of about fifty miles, supplemented by a precision approach radar.

Long Distance Aids to Navigation—At the request of the United Kingdom, Canada is co-operating in evaluation trials of a new type of long distance aid to air navigation known as DECTRA. Two experimental stations will be established on Canadian territory near Gander, Nfld. These two stations, along with two similar stations in the United Kingdom, are expected to provide parallel tracks and distance information to aircraft flying the North Atlantic region. It is expected that this system will be in operation by the end of 1956.

Surveillance Radar Equipment—To meet the urgent needs of air traffic control four Decca surveillance radar systems have been ordered for early installation at Montreal, Toronto, Winnipeg and Vancouver. This equipment will make it possible for airway traffic controllers to see transport type aircraft within a radius of 75 miles and enable them to increase the safety of flying activities in the area. In addition to the Decca equipment, fifteen sets of Raytheon surveillance radar equipment have been ordered which will enable traffic controllers to see small fighter type aircraft up to 100 miles and transport type up to 150 miles at elevations up to 60,000 feet. Four of these will replace the Decca installations which will then be moved to less important airports and the remainder will be installed at Halifax (Kelly Lake), Moncton, Quebec, Ottawa, North Bay, Lakehead, Kenora, Saskatoon, Regina, Calgary and Edmonton.

International Conferences

Under the International Civil Aviation Organization (ICAO) two regional meetings and one conference were held at which Canada was represented.

The Second Air Navigation Conference met in Montreal from August 30 to September 27. Delegates from 26 contracting states and five international organizations attended the Meeting. Observers from three non-contracting states were also in attendance. The Conference considered technical problems of a type which could not be handled by a meeting of a single technical division of the Organization.

The First Pacific Regional Air Navigation Meeting took place at Manila between October 27 and November 25. Seventeen contracting states and four international organizations were represented. The Meeting prepared plans for facilities and services for the Pacific Region.

A special North Atlantic Regional Air Navigation Meeting took place in Paris between February 20 and March 3, 1956. The Meeting was called to consider certain problems which had developed in the North Atlantic Region and which required immediate consideration.

INTERNATIONAL AND DOMESTIC COMMON CARRIER SERVICES

These Services include two sub-sections, under the direction of the Superintendent of Telecommunications, the functions of which are as follows:

- (1) International Traffic and Accounting—embraces the administration of National and International Telegraph Regulations and Agreements including the provisions of the Telegraph and Radio Regulations annexed to the International Telecommunication Convention as well as Canada's participation in the Commonwealth Overseas Communications System and liaison with Canadian Carrier Companies on Overseas traffic. The application of international tariffs is a major concern of this group and accounting for Aeronautical, Marine and point-to-point domestic and international traffic is part of this function.
- (2) Domestic Common Carrier Services—includes administration of the Government Telegraph and Telephone Service, leasing of communication facilities from commercial telegraph and telephone companies as required for the operation of Canadian airways and radio communications of the Air Services Branch and administration of the Northwest Communication System.

The Superintendent of Telecommunications has under his jurisdiction administration of the Telegraphs Act and during the past year his officers have been actively engaged in the preparation of an amendment to this Act to provide for the licensing of transoceanic undersea cables.

TRAFFIC ACCOUNTING

During the year accounts handled for commercial ship-shore and point-to-point messages via Marine Radio Stations numbered 218,905 with a total value of \$286,608.55. For air-to-ground and message communication services provided by aeronautical stations 133,156 accounts were handled totalling \$585,578.50.

The following information relates to messages and words handled and revenue collected:

Stations	Messages	Words	Revenue	
			\$	cts.
<i>Marine</i>				
East Coast.....	390,712	11,364,166	105,219	71
Great Lakes.....	55,789	978,494	29,171	71
Hudson Bay and Strait.....	297,288	18,263,447	9,080	73
West Coast.....	376,198	13,064,732	55,323	90
Premium Revenue.....			13,083	23
<i>Aeronautical</i>				
Private Commercial and Airline Messages.....			55,437	37
Radio Service to Airline Companies.....			374,572	31
	1,119,987	43,670,839	641,888	96
				\$641,888 96

DEPARTMENT OF TRANSPORT

Stations	Messages	Words	Revenue	
			\$	cts.
<i>Other Revenue</i>				
Examination fees—Radiotelegraph Operators Certificates of Proficiency..			1,703	00
Fines and forfeitures under the Radio Act.....			196	36
Licence Fees (Excluding private receiving and private commercial broad-casting).....			205,487	60
Rentals.....			184,501	38
Miscellaneous.....			38,028	04
			429,916	38
				\$429,916 38
Total Revenue.....				1,071,805 34
Collected for the Canadian Broadcasting Corporation from the issuance of Private Receiving and Private Commercial Broadcasting Station Licences in accordance with section 14 (1) of the Canadian Broadcasting Act.....				
				\$355,883 64

TELEGRAPH AND TELEPHONE SERVICE

The number of telegraph messages handled during the year was 136,138. Net revenues amounted to \$357,077.72. The total operating expense for the year was \$444,484.27.

The main features of the operation of the Government Telegraph and Telephone System in various districts were as follows:

Nova Scotia—In Cape Breton the work of improving existing circuits was continued with construction for the year being confined to short extensions for new subscribers. Some short sections of lines were rehabilitated. Negotiations were opened leading to the transfer of lines north of Ingonish Ferry to a commercial company of lines serving the area north and northeast thereof. A short section of telephone line extending over a distance of 5½ miles from North Sydney towards Frenchvale was sold to the Maritime Telegraph and Telephone Company.

Prince Edward Island—Submarine cables between Prince Edward Island and the Mainland are no longer maintained by the Department as service is otherwise supplied by commercial carriers and it is intended to dispose of them.

New Brunswick—Negotiations were opened with a view to disposing of facilities on the Grand Manan Islands including the radio link between there and the mainland. Lines in Chatham-Escuminac area continued to give service during the year.

Quebec—Expansion of the telephone system on the Magdalen Islands was continued to cope with a number of outstanding requests for service. Plans for the further expansion of outside plant together with procurement of materials was given primary attention. An automatic unattended dial telephone exchange was purchased for installation in 1956 in the Grosse Isle exchange area to replace an obsolete undersized manually operated magneto exchange. A radiotelephone link was established between the Grindstone and Grosse Isle telephone exchanges to provide improved service and to supersede the badly deteriorated landline trunks between these points. Arrangements were made with the Department of Public Works for the construction of an annex to the Federal Post Office Building to enable relocation and to double the capacity of the Grindstone switchboard facilities in 1956.

The outside plant in this area suffered damage during heavy sleet storms and required extensive repairs.

Financial assistance was continued during the year in the Gaspé area and the south shore of the St. Lawrence to small telephone organizations in Beauce, Bonaventure, Dorchester, Gaspé, Montmagny, and other Counties. A section of line in the St-Clément area was sold to the Kamouraska Telephone Company and negotiations were entered into for the disposal of another section in the St-Cyprien—Ste-Justine area to the Dorchester Telephone Company. Several new sections of line were constructed by departmental forces.

Ontario—Negotiations were opened with a view of disposing facilities on Manitoulin and Cockburn Islands to commercial interests operating in the adjacent areas. Financial assistance was given to a number of small telephone organizations on the Manitoulin Islands in the County of Algoma East.

Saskatchewan, Northern Alberta and Peace River Block—Facilities comprising several hundreds of miles of poleline and wires in these areas were continued in operation during the year. Extensive engineering and planning with respect to the expansion of outside plant in the Dawson Creek-Pouce Coupe and in the Fort St. John areas were undertaken. Automatic dial exchanges were purchased for installation in 1956 to establish a consolidated exchange area for Dawson Creek and Pouce Coupe. Arrangements were made with the Department of Public Works for the accommodation of these enlarged telephone exchange services. Additional materials were ordered and accommodation arranged for similar expansion of switchboard facilities and outside plant in the Fort St. John exchange area. Various lines emanating from central offices in this area were rehabilitated including reconstruction of a 30-mile section between Fort St. John and Hudson's Hope.

An existing line between Athabaska and Calling River and a leased facility between Athabaska and Edmonton were superseded by leasing lines from the Northwest Communication System between Slave Lake and Edmonton and by the establishment of a radio link between Slave Lake and Calling River. Negotiations were commenced with a view towards disposal of all telephone facilities in the Dawson Creek-Pouce Coupe-Fort St. John areas and for the closing of the telegraph services between Edmonton and points in northwest Alberta and the Peace River Block. Negotiations were also initiated with the object of likewise closing the service of the one line in Saskatchewan between Meadow Lake and La Loche in favour of commercial service by others.

LANDLINES

In accordance with established policy and practice, this Division arranged for the construction, maintenance and operation of departmentally-owned landlines and for the leasing, from commercial communication companies and agencies, of various longline and local wire and other communication services generally for the following purposes:

Air Traffic Control—The Airway Traffic Control Interphone network was expanded to satisfy requirements due to an increasing volume of both civil and military operations. A new express circuit was established between Moncton and Gander to facilitate rapid coordination between Air Traffic Control Centres.

To relieve loading on existing voice circuits, additional service points were added to the Air Traffic Control trans-border teletype circuit south of Edmonton.

The interphone network was extended from Gander to Goose and negotiations advanced for a further extension from Goose to Frobisher.

Air Carrier—Negotiations for the establishment of teletypewriter tape relay centres at Gander and Goose were advanced. Several local teletype circuits were established and others were negotiated for operation at an early date.

Marine—Negotiations for changes in terminal equipment on the Montreal-Fame Point circuit were advanced as well as arrangements for improvement of operation of the circuit.

Meteorological—The weatherfax system was further expanded in line with initial planning. Service was also extended by means of radio to remote locations where wirelines do not exist. An additional connection was established at Mont Joli in conjunction with increased northern activities. Changes and equipment relocations were carried out as required.

Navigational Aids—Over 130 negotiations for lease of control facilities, attachment privileges, maintenance of lines and accommodation of foreign-owned equipment were advanced.

General—The Department's West Coast FM Stations were disposed of to the Northwest Telephone Company and negotiations were undertaken to supersede the existing arrangement with respect to the East Coast FM Stations.

NORTHWEST COMMUNICATION SYSTEM

During the year System facilities were expanded by means of high frequency carrier to provide an additional 2,910 miles of telephone and 5,423 miles of telegraph carrier channels and preparatory work undertaken to produce six additional telephone channels between Edmonton and Whitehorse (8,500 channel miles) by a similar method. High grade communications were established into Valleyview by carrier method and a commercial telegraph office opened at that point. Two new radio telephone and telegraph links to McDames Creek and Quill Creek, Y.T., were placed in operation. Establishment of voice, telegraph and mobile radio services as well as the erection of 30 miles of transposed wires for pipeline purposes in the Haines area was completed as planned. Provision of a programme channel for Canadian Broadcasting Corporation purposes between Edmonton and Grande Prairie was advanced.

Public telephone service was extended to 24 hours per day at all repeater stations and additional switchboard facilities installed at Dawson Creek. Money order transfer service was made effective to enable funds to be wired from all offices of the Northwest Communication System to points in the United States and Canada. A telegraph office was opened in Whitehorse as a step towards increased service in the north. Requirements of oil exploration companies were handled in a satisfactory manner.

Replacement of 5,607 spruce poles was carried out; 500 other poles were reset and 188 new poles installed on branch lines. Chemical brush control was carried out for a distance of 122 miles north of Fort Nelson. A total of eleven miles of the main line poleline was diverted due to highway rerouting. Storage battery installations at five repeater stations were replaced.

A major undertaking was the commencement of construction of the so-called "4-pair build" consisting of 2,488 wire-miles between Whitehorse and the Yukon-Alaska border to tie in with the Alaska Communication System's facilities. Clearing of 200 miles of right-of-way was done and all crossarms and hardware installed on this 311 mile section to enable stringing of wires in 1956-57.

Replacement of 28 vehicles was accomplished and two new semi-trailers for dining and sleeping purposes were obtained and placed in service. The new Fort Nelson repeater station was completed and a good start made on the new repeater station project at Whitehorse. The repeater station building at Blueberry was insulated and other major repairs to it were undertaken. Material storage buildings were constructed at Fort Nelson, B.C. and Canyon Creek and Destruction Bay, Y.T. An oil-fired heating installation was made at the vehicle repair shop at Whitehorse, Y.T.

During the year 143,002 telephone calls and 101,284 telegraph messages were handled, and revenues amounting to \$2,231,483.46 were earned by the System. The total cost for operating and maintaining the System was \$1,635,332.16.

Respectfully submitted,

F. G. NIXON,

Controller of Telecommunications.

A/V/M A. DE NIVERVILLE, C.B., LL.D.,
Director of Air Services,
OTTAWA.

CANAL SERVICES

SIR,—I have the honour to submit the annual report of Canal Services for the fiscal year ended March 31, 1956.

The canals of Canada are concentrated in the St. Lawrence River Basin, the most important being those which comprise the Main Route through the Great Lakes and along the St. Lawrence River. During the 1955 season the Canso Canal, providing a navigation channel through the recently constructed Canso Causeway connecting Cape Breton Island and Nova Scotia, although still under construction, was opened on September 1 for vessels with a draft not exceeding ten feet. This draft was increased to 12½ feet in December of 1955.

The canals on the Main Route make navigation possible for a distance of 1,875 miles from the Atlantic seaboard to the western end of Lake Superior. The commercial value of this waterway is of great importance and is reflected by the tremendous growth of the many industrial areas which are established on both sides of the International border. The tonnage of freight passing through the Welland Canal has increased by 62 per cent in the last ten years while the number of vessel passages has increased by 69 per cent in the same period.

The eight Secondary Canals operated by Canal Services have also shown considerable increases in traffic through them and these canals are being maintained in suitable condition to serve the public.

The Canal Regulations have been extensively revised and improved to meet more closely the needs of the public and to regulate present day heavy traffic more adequately.

During the year close co-operation was maintained with The St. Lawrence Seaway Authority and operations of the existing canals have been adjusted on occasions to facilitate the carrying out of certain work by the Authority. Also, it has been necessary to expropriate over 52 acres of land for use in expanding the facilities of the Cornwall Canal in anticipation of future requirements.

This report contains information which has been compiled from statements submitted by Canal Superintending Engineers and Canal Services' Headquarters Engineers from which more detailed information is available.

Respectfully submitted,

R. J. BURNSIDE,
Director, Canal Services.

J. R. BALDWIN. Esq.,
Deputy Minister of Transport,
OTTAWA.

PRECIPITATION, LAKE LEVELS AND STORAGE BASINS

Trent Canal

The Trent Canal system extends from the Bay of Quinte on Lake Ontario to Port Severn on Georgian Bay, Lake Huron, the watershed of the system covering an area of approximately 7,200 square miles, of which 4,836 square miles are drained by the Trent River to Lake Ontario; the Lake Simcoe-Severn River Basin, 2,364 square miles in extent, draining into Georgian Bay.

Precipitation at Peterborough in 1955 was below normal, being 26.56 inches, whereas the average for the last 56 years was 31.19 inches. Precipitation at Washago was also below normal, being 34.81 inches, whereas the average for the last 28 years was 36.50 inches.

Rideau Canal

The Rideau Canal system consists of two main watersheds: the Rideau River Basin, 1,500 square miles in extent draining into the Ottawa River, and the Cataraqui River Basin, 500 square miles in extent draining into Lake Ontario at Kingston.

The spring freshet of 1955 was above normal, reaching a peak flow of 11,350 c.f.s. at Long Island on April 6, with resultant minor flooding in Ottawa. Precipitation dropped below normal later in April and remained considerably below normal during May, June and July, making it necessary to draw on Bobs Lake and Wolfe Lake for reserve water to maintain proper water levels for navigation and power requirements.

NAVIGATION

The Main Route or Primary Canals along the St. Lawrence River and through the Great Lakes were operated 24 hours a day throughout the navigation season, Sundays and holidays included, in accordance with *Notice to Mariners No. 19* of 1955. The St-Ours and Chambly Canals also were operated 24 hours a day on week days throughout the season of navigation and on Sundays from June 10 to September 2, inclusive; otherwise, during the navigation season, these canals were operated on Sundays by a skeleton staff for the accommodation of freight vessels only.

OPENING AND CLOSING DATES—1955

Canal	Opening Date	Closing Date	Total Days of Navigation
<i>Main Route Canals—</i>			
Sault Ste. Marie.....	April 5	December 12	252
Welland Ship.....	April 1	December 15	259
Cornwall.....	April 18	December 10	237
Williamsburg.....	April 18	December 10	237
Soulanges.....	April 18	December 10	237
Lachine.....	April 18	December 10	237
Canso.....	Sept. 1	January 14/56	136
<i>Secondary Canals—</i>			
Ste. Anne.....	April 18	November 26	223
Carillon-Grenville.....	May 9	November 19	195
Chambly.....	April 30	November 27	212
St. Ours.....	April 30	November 28	213
Trent.....	May 14	November 12	183
Murray.....	April 4	December 6	247
Rideau.....	May 2	November 16	199
St. Peters.....	April 18	January 7/56	265

The new Canso Canal was opened for navigation during daylight hours for vessels having a draft not greater than 10 feet. As construction progressed, the permissible draft was increased to 12 feet 6 inches.

The official closing dates of the various canals were announced in *Notice to Mariners No. 141* and *No. 149* of 1955.

VESSEL TRAFFIC AND FREIGHT

Sault Ste. Marie Canal

The total freight passing through the Sault Ste. Marie Canal was 2,202,638 tons as compared with 2,610,277 tons for the previous year, a decrease of 15.6 per cent. The principal commodities were wheat and other grains, soft coal, oil, pulpwood, sand, stone and mill products. The total tonnage upbound was 716,784 with 1,485,854 tons passing downbound.

Freight through the United States and Canadian Locks totalled 114,555,298 tons, of which 101,685,320 tons were carried downbound and 12,869,978 tons upbound. During the previous year the freight amounted to 85,417,658 tons.

Welland Ship Canal

The total freight handled through the Welland Ship Canal in 1955 amounted to 20,893,222 tons as compared with 17,514,258 tons in 1954, an increase of 19.3 per cent. There were 4,697 upbound and 4,636 downbound vessel passages, a total of 9,333 passages.

The principal commodities and tonnage transported were as follows:

	Tons	Per Cent
Wheat	2,738,209	13.1
Other grains	2,537,975	12.1
Coal and coke	5,435,006	26.0
Ore	4,435,839	21.2
Pulpwood	509,566	2.4
Oil products	2,723,277	13.1
Other commodities	2,513,350	12.1
Total	20,893,222	100.0

The following are the percentages of the total freight carried by vessels of the upper lake type (whose overall length exceeds 260 feet) for the seasons 1946 to 1955 inclusive:

1946—47%; 1947—54%; 1948—54%; 1949—49%; 1950—50%;
1951—51%; 1952—50%; 1953—56%; 1954—57%; 1955—55%.

St. Lawrence River Canals

The total freight tonnage passing through the Cornwall Canal amounted to 10,862,194 as compared with 9,121,931 in 1954, an increase of 19.1 per cent. There were 4,649,619 tons carried upbound and 6,212,575 tons downbound. The principal commodities and tonnages were:

	Tons	Per Cent
Grain	3,650,753	33.8
Oil products	1,363,909	12.5
Bulk and package freight	1,889,340	17.3
Newsprint	197,601	1.8
Coal	1,521,106	14.0
Pulpwood	446,194	4.1
Ore	1,794,024	16.5
Totals	10,862,194	100.0

Vessels of Canadian registry transported 93 per cent of the total freight carried through these canals.

Traffic Statistics

The following table compiled from the Superintending Engineers' records shows the number of upbound and downbound vessels, together with freight passing through the various canals:

Canal	Vessels			Freight Tons (2,000 lbs.)		
	Upbound	Downbound	Total	Upbound	Downbound	Total
<i>Main Route—</i>						
Sault Ste. Marie.....	2,847	2,645	5,492	716,784	1,485,854	2,202,638
Welland Ship.....	4,697	4,636	9,333	4,259,992	16,633,230	20,893,222
Williamsburg.....	3,573	3,614	7,187	4,497,823	6,404,215	10,902,038
Cornwall.....	3,446	3,463	6,909	4,649,619	6,212,575	10,862,194
Soulanges.....	3,551	3,594	7,145	Freight statistics are not recorded		
Lachine.....	4,825	4,836	9,661			
Canso.....	251	251	502	4,729,637	6,126,203	10,855,840
				7,045	7,562	14,607
<i>Secondary—</i>						
Ste. Anne.....	3,839	3,320	7,159	400	204,300	204,700
St. Ours.....	670	645	1,315	70,073	21,386	91,459
Chambly.....	350	328	658	25,948	24,093	50,041
Carillon-Grenville.....	299	297	596	Nil	Nil	Nil
Trent.....	14,286	13,601	27,887	260	315	575
Murray.....	3,058	3,046	6,104	1,686	315	2,001
Rideau.....	12,333	11,892	24,225	248	165	413
St. Peters.....	372	408	780	1,758	4,458	6,216

A comprehensive annual report prepared by the Public Finance and Transportation Division of the Dominion Bureau of Statistics in collaboration with Canal Services, giving a detailed analysis of freight and vessel movements throughout the various canal systems, is obtainable from the Dominion Bureau of Statistics, Department of Trade and Commerce, Ottawa.

Vessel Construction

During 1955, one new upper lake package freighter and five new St. Lawrence Canal type bulk carriers, all of Canadian registry, were commissioned to service. They include the *Fort Henry*, the first new upper lake package freighter built in 30 years. The only United States vessel added to the lake fleet was the upper lake type self-unloader *Detroit Edison*.

Vessel Losses

On August 21, the steamers *C. J. Callaway* and *B. F. Jones* collided in the lower St. Mary River and as a result of this collision the *Jones* was disposed of for scrapping, but the *Callaway* was not damaged beyond repair. The *B. F. Jones* was an upper lake type bulk carrier.

Foreign Vessels in Lake Trade

The number of foreign vessels engaged in the lake trade increased to 119 from the previous year of 100, and the number of trips during the season amounted to 329, as compared with 267 in 1954.

The first inbound passage was made by the Dutch M.V. *Prins Fredrik Willem* which passed Port Colborne on April 22, and the final outbound passage of the season was made by the Norwegian S.S. *Askepot* which passed Port Colborne on December 3.

Freight Handled over Canal Wharves

Freight transferred over canal wharves to and from vessels was as follows:

Canal	Tons (2,000 lbs.)
Sault Ste. Marie	2,631
Welland Ship	3,397,221
Williamsburg	152,743
Cornwall	335,017
Lachine	2,420,961
Chambly	8,049

During the non-navigation season, 74 vessels wintered in the various canals.

HYDRAULICS

Ontario-St. Lawrence Canals

All levels in the Ontario-St. Lawrence Canals were brought to normal on April 14, 1955. From December 15, 1955, to March 17, 1956, the reaches west of Lock 20 were maintained $2\frac{1}{2}$ feet below normal to facilitate control of levels during winter months.

Bergin Lake was lowered 8 feet below normal during March 15-18, 1956, to permit the installation of a water intake pipe for New Town No. 2 by the Hydro-Electric Power Commission of Ontario.

On March 17, 1956, the water level between Locks 17 and 19 was lowered $10\frac{1}{2}$ feet to facilitate inspection of the canal prism and to carry out underwater repairs.

During the latter part of March, 1956, the reach between Locks 19 and 20 was lowered to facilitate excavations for a proposed wharf and dock on north bank above Lock 19.

On December 15, 1955, in the Rapide Plat Canal, water levels were lowered five feet to permit repairs to timber cribs on the north side of the canal west of Lock 23.

The two power plants of Canadian Cottons, Ltd., were in operation from April 17, 1955, until the canal was unwatered on March 17, 1956.

The City of Cornwall's pumping plant reverted to water power on April 14, 1955, and operated continuously until March 17, 1956, when the plant changed over to steam and electric power.

The Village of Morrisburg power plant was operated as follows:—

- 1 hr. per day 5 days a week from April 18 to September 30, 1955
- $1\frac{1}{2}$ hr. per day 5 days a week from October until December 15, 1955,
(plant shut down to permit repairs to cribs)
- $1\frac{1}{2}$ hr. per day from January 16, 1956, to end of month.
- 1 hr. per day 5 days a week from February 1 to March 31, 1956.

The Village of Morrisburg pumping plant was used principally as a standby unit.

The Village of Iroquois municipal plant was not used to any extent.

Welland Canals

Periodic meterings have been made of the flow used by the plants and municipalities along the Welland Canals and of the total flow in the Second Canal.

The Hydro-Electric Power Commission of Ontario took water out of the Welland Ship Canal through the two intakes at Allanburg to Lake Gibson for its DeCew Falls Power Plant. The flows covered by the Commission's leases are as follows:—

	Maximum Daily Flow	Peak Flow
Lease No. 30245	1100 c.f.s.	1210 c.f.s.
Lease No. 45185	330 c.f.s.	363 c.f.s.
Lease No. 42777	2500 c.f.s.	2500 c.f.s.
Supplemental Agreement to Lease No. 42777	2500 c.f.s.	2500 c.f.s.
Total	6430 c.f.s.	6573 c.f.s.

The average flow and the maximum hourly flow in c.f.s. from the Welland Ship Canal to the DeCew Falls Power Plant have been computed for each day. The hourly and daily flows used to generate power for the Welland Ship Canal and for the Hydro-Electric Power Commission of Ontario have also been computed.

A daily record has been kept of the average flow into the Welland Ship Canal at Port Colborne and its distribution. The following table gives the average monthly distribution of flow down the canal in cubic feet per second during 1955-56:—

Month	Group A	Group B	Group C	Group D		Totals
	City of Welland and Vicinity	H.E.P.C. and Vicinity	Second Canal Supply Weir and Alliance Paper Co. and Vicinity	Lock No. 7 and Weir No. 7	W.S.C. Power House	
April.....	290	6,254	349	778	190	7,861
May.....	296	6,076	349	931	123	7,776
June.....	326	4,715	325	956	99	6,421
July.....	336	4,515	333	887	92	6,163
August.....	323	4,623	342	882	94	6,264
September.....	295	5,428	343	883	107	7,056
October.....	289	6,273	343	899	138	7,943
November.....	297	6,105	348	854	208	7,812
December.....	291	6,406	347	302	238	7,584
January.....	280	6,457	346	8	244	7,335
February.....	288	6,347	349	8	245	7,266
March.....	282	6,379	343	153	229	7,387

The average flows out of the Ship Canal for the navigation and non-navigation seasons are shown classified below and include surface run-off into the Canal:—

Allotment	During Navigation Season	During Non- Navigation Season
For Navigation purposes.....	869	51
For Canal Power.....	137	239
For Second Canal.....	265	266
For Industries.....	86	88
For Municipalities.....	325	304
For H.E.P.C. (Surplus Water).....	1,430	1,430
For H.E.P.C. (Supplied by H.E.P.C.).....	4,087	4,954

Sault Ste. Marie Canal

During the year, upon the direction of the Lake Superior Board of Control, regulation of the flow from Lake Superior was effected by changes in the disposition of the gates of the St. Mary's River Compensating Works.

Rideau Canal

The spring freshet of 1955 had high flows and reached a peak of 11,350 c.f.s. at Long Island on April 6, 1955. Minor flooding occurred in Ottawa along Riverside Drive and at Nordic Circle.

During May, June and July, precipitation was considerably below normal and all lake levels fell. The flow of water from Big Rideau Lake was reduced to a minimum and to maintain the lake level it was necessary to draw heavily on Bobs Lake and Wolfe Lake for reserve water.

Precipitation was above normal in August and this held navigation lakes and storage lakes at a fairly constant level.

Commencing in mid-September, in accordance with standard practice, the lakes in the southern descending levels were gradually lowered in preparation for the coming winter. The northern storage lakes were also lowered and were at their winter levels well before the formation of ice. The flow from Big Rideau Lake towards Ottawa was increased to 300 c.f.s. during the lowering of the lakes. The southern descending levels held fairly constant throughout the winter while the northern descending levels were allowed to drop to provide storage for the spring run-off. The annual snow survey for the winter of 1955-56 was made on February 27, 28 and 29. The results indicated below normal depth of snow cover and water content for that time of the year. Cold weather in March, 1956, delayed the spring freshet.

Trent Canal

Flow in the Otonabee River was considerably below average in April and continued to decline during the summer months with a minimum discharge of 740 c.f.s. recorded in September. However, excessive rains in October caused a fall freshet reaching a peak of 4,618 c.f.s. on October 23, 1955, and receded to an average of 3,200 c.f.s. for November and 2,000 c.f.s. for December.

The water in storage in Kawartha and Northern Reservoir Lakes was below average due to exceptionally sub-normal precipitation which continued throughout the summer but strict and exacting control of the use of reservoir water was exercised to maintain day to day flows and ensure adequate supply for power and navigation purposes. Heavy rains in October alleviated conditions and northern reservoirs were restored as much as 15% while Kawartha Storage was filled above normal.

Water levels on Lakes Simcoe and Couchiching were slightly below average for the greater part of the year. Increased discharge of the Black River following the heavy rains in October enabled flow from Simcoe and Couchiching to be checked and levels of the lakes restored some additional storage for winter use. Highest level attained by Lake Simcoe during spring freshet was 719.75 on April 21 and the lowest 718.0 on October 5, 1955.

Power houses on the Trent System were able to operate at full capacity and wastage of surplus water was necessary in January and February 1956 to bring the lake levels down. Total water wasted during the year was equivalent to 1.98 feet on Simcoe and Couchiching.

New staff gauges were installed at eleven stations and automatic recording gauges were also installed and checked. Snow surveys were made at Gilchrist, Ardtrea, Bradford, Cannington and Kirkfield in February, 1956. The results indicated a very high run-off from the surrounding watershed.

ELECTRICAL DESIGN, INSTALLATION, OPERATION AND MAINTENANCE

In addition to the electrical engineering studies for operation and maintenance of the canals, this headquarters division was responsible for the supervision and inspection of the electrical installation of the Canso Causeway Project, both for the project Consulting Engineer and the Department.

Electric power for operating the electrified locks and bridges and for lighting the locks and reaches of the various canals is purchased from local authorities, with the exception of the Soulanges and Welland Canals where departmental power houses are maintained. On the Quebec Canals during the year the power supply to Black's Bridge No. 1 on the Lachine Canal was transferred from the Montreal Transportation Commission to the Canal System and the supply cables to Bridges 3 and 6 were renewed. The lighting system of the Ste. Anne Canal was extended to the south side and the windings were replaced in the Soulanges Canal generators. On the Ontario-St. Lawrence Canals a dial telephone system was installed on the Williamsburg Canals and connected to the Cornwall Canal system. The Canso Canal system including the Causeway lighting was installed and put into operation. A new bridge control was installed on Bridge No. 3 of the Welland Canals and the winding of one of the transformers from Lock 5 substation was renewed. As on the Cornwall Canal, several sections of the canal pole line were altered to facilitate work of the St. Lawrence Seaway Authority contractors. The motors of Lock 1 of the Third Welland Canal were converted to 60 cycles. Bridges 11 at Merrickville and 19 at Smiths Falls across the Rideau Canal were electrified and provided with electrically operated traffic gates and electrification of the Canadian National Railway Bridge across the Murray Canal was commenced.

GENERAL MAINTENANCE

Main Line Canals

On the Lachine and Soulanges Canals lockgates were repaired; bridges were painted where necessary; riprapping was carried out and necessary concrete repairs done.

On the Cornwall and Williamsburg Canals, dredging was carried out and canal banks repaired; several gates were fitted with lubricated pintles; lockgates were repaired; bridge roadways were resurfaced and one swing bridge was painted.

On the Welland Ship Canal taintor valves and lockgates were scraped and painted; concrete restoration work was carried out in the lock filling culverts; canal banks were riprapped; bridge roadways were resurfaced and new ladders installed in the fender bollard pits at four locks. An automatic water gauge station was installed at Port Weller for the Department of Mines and Technical Surveys.

At Sault Ste. Marie the main gate sill was repaired, worn cables were replaced and the motor houses painted.

Secondary Canals

On the Ste. Anne, Carillon-Grenville, St. Ours and Chambly Canals necessary maintenance items included the following: lockgate painting; concrete restoration work; dredging; repairs to decks of seven bridges and replacement of two lockgates.

On the St. Peters Canal belting aprons were renewed on lockgates and concrete restored on the east and west Atlantic entrance walls.

The various structures of the Trent and Murray Canals were maintained. Major items included lockgate painting; building of new gates for three locks; concrete restoration work; repairs to bridges; construction of a new abutment for Bridge 27; bridge painting; installation of Flex-beam guard rails on the approaches to five bridges and reinforcement of Bridge 60.

On the Rideau Canal bridges and lockgates were painted; concrete restoration work, including rebuilding sections of canal wall, was carried out; new gates were built and installed at two locks; Flex-beam guard rails were installed at the approaches to one bridge; Fixed Bridge 32 was rebuilt and Bridge 41 was moved upstream to clear the site for erection of a new swing bridge.

MECHANICAL DESIGN, INSTALLATION, OPERATION AND MAINTENANCE

Mechanical engineering studies, inspections and testing of equipment formed the basis of the year's work by headquarters staff. The more important items of maintenance included the following:

On the Lachine Canal the hydraulic fender control panels at Lock 4 were modified extensively, the machinery on Bridge 1 was overhauled and the operating machinery of Bridge 8 was moved to accommodate the widening of the traffic lanes. A coupling of one of the Soulanges Canal power house turbines was replaced as were three lock gates at Lock 4. A Dominion shovel damaged while working on the Lachine Canal was moved to the Soulanges Canal, repaired and mounted on a three axle truck. On the Cornwall Canal the hydraulic system at Lock 15 and the engine of the Dominion shovel were overhauled, machinery at Lock 21, Gate 2, was renewed, as was the drive shaft on the Mille Roches Swing Bridge, and the engine in the Bucyrus-Erie crane shovel. The main drive gear and crown gear of the Cardinal Swing Bridge on the Galop Canal were renewed. On the Welland Ship Canal twenty-four gate ropes were replaced, as were the broken bolts in the segmental girders of Bridges 6 and 7. Three stoney valves were completely overhauled, Bridges 7 and 9 and the interiors of eight 82-foot lockgates and four 35-foot lockgates were cleaned and painted and a new pintle and bushing were installed at Gate 2, Lock 7. The gears of the gate machines on the Third Welland Canal were changed with the conversion to 60 cycle power. Seven gate cables of the Sault Ste. Marie Canal were replaced and the Canal Tug "Tanac V-222" was drydocked for regular inspection. The mechanical mechanism of the Canadian National Railway Bridge on the Murray Canal was overhauled, as was the machinery of the Peterborough Lift Lock. The rail wedges were replaced and a new engine was installed on Bridge 55 at Washago.

ENGINEERING AND CONSTRUCTION

Quebec Canals

Lachine Canal—Parts of Bridge No. 4 were renewed where necessary, and extensive repairs to the floor system were carried out. The machinery of Bridge No. 1 was completely overhauled. The track and rack segments were reset on new foundations. The area south of south Lock 2 and the canal yard at Mill Street were repaved with asphalt. The pivot pier of Bridge No. 5 (Atwater Ave.) was demolished and removed. The roadway of Bridge No. 8, Lachine, was widened by reconstructing the sidewalk on the outside of the east truss. The submerged berth for lockgates in the Wellington Basin was completed. Repairs were made to the Stores Building. A shed for storing heavy materials and machinery was rebuilt. Concrete retaining walls were repaired or built where considered necessary.

Soulanges Canal—The roadway on the south side of the canal was partly resurfaced with asphalt and a similar treatment was applied in the canal yards where necessary. Some bridges on the south side of the canal were repaired. Some masonry copings were renewed in concrete. Slope walls where necessary were relined with one-man stone. Five lockgates were rebuilt.

Carillon-Grenville Canals—A damaged section of the Carillon Dam was rehabilitated. The apron was renewed where necessary. Stone walls above Lock No. 6 were underpinned and damaged wall sections were rebuilt in concrete. One pair of lockgates was completed.

Chambly Canal—The bottom of Lock No. 5 was rebuilt in concrete. Sections of dry masonry wall were rebuilt in concrete where considered necessary. A flat scow 50' x 20' x 4' 6" was built.

St. Ours—The St. Ours Dam was reinforced on the down and upstream sides, and six booms were built and installed.

Old Beauharnois Canal—A bituminous concrete pavement was laid on the earth fill placed across the canal at St. Timothee, at the site of a former bridge.

Ontario-St. Lawrence Canals

Cornwall Canal—One new lockgate was built and four pairs of lockgates were overhauled. A length of 4,447 lineal feet of canal banks were riprapped. Stoplogs were placed in two bays of Lock 21 weir, and new hangars were installed in the stoplog checks. The excavation, reinforced concrete foundation, and grease pit of the new store building were completed. The steel sheet piling was driven in the south canal bank below Lock 19, and two timber booms were built. The control weir at Lock No. 19 was repaired and the operating machinery was overhauled. The weir at Lock 18 was repaired and the machinery overhauled. A cable guard was provided along part of the south canal bank above the guard gate.

Williamsburg Canals—Five spare lockgates were rehabilitated. To provide for future two-way navigation three passing places were dredged: (a) immediately west of Lock 25 (b) at Presqu'île (c) at MacDonald's Bay. Riprap was placed along the Farran Point, Rapide Plat and Galop Canals. The detached cribs and bridges on the north bank above Lock 27 were rehabilitated. From the top of cribs 3 and 4, disintegrated concrete was removed and replaced with cellular type reinforced concrete caps. Bridges 2, 3 and 4 were replaced. On the north side of the canal, deteriorated timbers were renewed and the cribs backfilled with stone. The construction of a new hull for a derrick scow was started. Sheet piling for shore and intermediate cribs was driven above Lock 25. Mooring posts were installed along the Galop Canal. Alterations were made to the Cardinal office at Locks Nos. 27 and 28.

St. Peters Canal—The easterly side of the lake entrance and the wharf and bank on the westerly side of the Atlantic entrance were rehabilitated. The lake entrance was widened. At the Atlantic side, two new creosoted timber cribs were built and sunk at the end of the wharf. A reinforced concrete cap was built on the new cribs and on the closure crib. Revetment was placed on the sloped bank. Major alterations and repairs were made to the superintendent's residence.

Welland Canals

The metal of Bridges 7, 9 and 14 was painted. Cleaning and painting of the interiors of 12 gates were done under contract No. 54831. Deteriorated concrete was removed from the breast wall of Lock No. 2 and rebuilt to its original lines. The repairs to the east filling culvert of Lock 7 were continued. The area between the centre walls of Locks 5 and 6 was paved. The road on the west side of the canal was repaired. The deck of Bridge No. 5 was resurfaced. Gate anchorages where necessary were replaced. The west pier of the Port Weller Harbour was repaired.

Sault Ste. Marie Canal

The super-structure of the northeast entrance pier was demolished and the cribs were filled with stone and grout under pressure in order to support a new concrete coping under construction. The work was approximately 60 per cent completed when stopped in December. Part of the south lock wall was refaced with concrete. New fender floats were built and installed. A new sheet steel building was erected.

Rideau Canal

Extensive repairs were made to canal residences at Hartwells, Hogsback, Smiths Falls, The Narrows, the Smiths Falls Lock residence and the Beveridges Lock Station residence. Repairs to the old concrete retaining wall along the canal road north of Hartwell Lock were made. The flooring of Bridge No. 14 was renewed in timber. The sub-structure for the new bridge at Kingston Mills was completed.

Trent Canal

The old Warsaw Road Bridge was removed; a new abutment was built on the west side and the pivot pier as well as the east abutment were extended to accommodate a new swing span which was ninety per cent completed before the end of the fiscal year. The culvert at Lock No. 12 was restored. The upper entrance wall of Lock 17 was repaired. Concrete restoration work was carried out where considered necessary. Lockgates were built and new stop-logs were provided as replacements. Repairs were made to dams No. 8 at Lock 23, at Grace Lake, and at Lock No. 32, Bobcaygeon. The concrete of the deck slab of the glance pier of the C.N.R. Bridge at Hastings was replaced by reinforced concrete. Extensive improvements to nine canal residences were carried out.

Murray Canal

The electrification of the C.N.R. swing bridge was completed with the exception of the power unit. A cable guard rail was erected along the north bank between the Carrying Place Bridge and Brighton Road Bridge. Part of the southwest entrance pier was renewed and sections of the banks protected with one-man stone.

LEASES, LICENCES, PERMITS AND PLANS

Quebec Canals

Eight leases and 28 licences were issued and 12 leases and 47 licences were cancelled during the year. Twenty-eight Letters Patent and one agreement were completed. One contract was awarded. Nine plans were prepared and 1,862 prints were made. Numerous photographs were taken on Lachine and Carillon-Grenville canals.

Ontario-St. Lawrence Canals

One lease and 26 licences were issued, 13 of which were for boathouse lots. One lease and 10 licences were cancelled. One hundred and thirty-three boathouse licences were renewed and 10 were cancelled. A total of 99 plans, charts, sketches and graphs were prepared and 2,035 prints were made, of which 231 were coloured.

Welland Canals

Thirty-five leases and licences were issued during the year. Five Letters Patent and deeds were also issued or executed and four contracts were awarded. Fifteen leases and licences were cancelled, and two licences, issued locally, were cancelled. A total of 13,581 prints were made, of which 8,014 were of foolscap size. Seventy photographs showing special maintenance jobs and work progress on all new projects were taken and 850 photographic prints developed.

Sault Ste. Marie Canal

No new leases, licences or permits were issued, nor were any cancelled during the year.

Rideau Canal

Twenty-four licences were issued, one locally, and two agreements were completed. Fourteen licences were cancelled. A total of 87 plans, graphs and sketches were prepared.

Trent Canal

Seventy-nine licences and two leases were issued, also three agreements, two Letters Patent and six deeds were completed. One lease and 47 licences were cancelled. A total of 41 plans were prepared.

MARINE SERVICES

SIR,—I have the honour to submit the annual reports for the fiscal year ended March 31, 1956, of the following Divisions of the Marine Services of the Department of Transport, and of certain work connected with Marine Services:

Aids to Navigation
Nautical Division
Marine Agencies
River St. Lawrence Ship Channel
Ships and Floating Equipment

The above is respectfully submitted.

NORMAN WILSON,
Director, Marine Services.

J. R. BALDWIN, Esq.,
Deputy Minister of Transport,
OTTAWA.

AIDS TO NAVIGATION DIVISION

SIR,—I have the honour to submit the annual report for Aids to Navigation Division for the fiscal year ended March 31, 1956.

The Aids to Navigation Division controls the following activities at Ottawa and throughout Canada:

Construction, repair, operation and improvement of all lighthouses, fog alarms, lightships, buoys, beacons and other aids to marine navigation, including Sable Island Establishment.

Survey and acquisition of lighthouse sites and the control of Marine Agency properties, including construction and maintenance of District Marine Agency buildings and wharves.

Administration of all Marine Agency shops including the research establishment at the District Marine Agency, Prescott, Ont.

Lease and sale of water lots in public harbours.

Supervision of public harbours and the control of waterborne traffic in them.

Maintenance, operation and inspection of public wharves.

Removal of derelicts, wrecks and other obstructions to navigation.

Supervision of cable ferries and the lighting of bridges over navigable waters including the control of movable spans and waterborne traffic through them.

Buoy contracts and icebreaking Thunder Bay.

Annual publication of the *List of Lights and Fog Signals* in four volumes and the issue of *Notices to Mariners*.

AIDS TO NAVIGATION

Navigational aids continue to show a steady increase. The tables accompanying this report set out by districts the number of each different type of aid in operation during the year and it is noteworthy that the total number of lights now exceeds 3,000. As part of the regular programme, major commercial routes and other traffic lanes were further improved with the establishment of several new lights, lighted buoys and other aids. With the extension of hydro into new areas an ever increasing number of lights are being converted to electricity and where hydro is not available many battery operated units are in operation. Over the past five years nearly 250 stations, including several major lights, have been changed to modern electric equipment. Progress is continuing in the development of remote control fog alarms.

Plans and specifications are being worked out with the United States authorities to establish a uniform system of aids in the International Section of the St. Lawrence Seaway and new systems of aids in the purely Canadian sections are also being planned for progressive installation as the Seaway develops. For a number of years aids to navigation in the Mackenzie River-Great Slave Lake Waterways have been managed with the co-operation of the Department of Northern Affairs and National Resources through their representative at Fort Smith, N.W.T. However, with the marked increase in traffic on these northern waters, an expanded programme of aids and other improvements is planned including the creation of a new District Marine Agency for the Northwest Territories and Western Arctic.

CONSTRUCTION

Eighteen new dwellings, four major light towers and four fog alarm buildings were constructed. In early June, 1955, the steel pier for the new White Island Lightstation, replacing White Island Lightship, was towed from Quebec and placed in position. Construction of this station was near completion when winter forced a close-down of operations with approximately six weeks' work remaining to be done.

Plans were prepared and tender let for the construction of a new power fog alarm station at Chatham Point, B.C. A steel pile structure was designed and contract awarded for a new lightstation to replace the old Sand Heads Lightship at the mouth of the Fraser River, B.C. A series of storms prevented starting work on this project before winter. Plans and specifications were drawn up for a Pilotage Office at Father Point, Que., and new buildings and other storage facilities were constructed at Amherstburg Buoy Depot in Ontario. Substantial wharf repairs and other improvements at the District Marine Agencies were carried out.

In addition to these major projects many new small lightstations were established and the repair and improvement of existing lighthouse structures go on continually. In recent years particular emphasis has been given to wiring dwellings for electricity and other changes designed to provide improved living conditions for lightkeepers.

MECHANICAL EQUIPMENT

During the year three new fog alarms were in various stages of construction and 20 stations throughout the country were equipped with new fog alarm machinery. Modern diesel engines are proving very satisfactory and 15 units were installed. Workshop and yard facilities at the District Marine Agencies are being progressively modernized and as part of this programme several Agencies were supplied with additional machine shop and woodworking equipment as well as certain portable items to facilitate work in the field. Three mobile hoists or cranes were provided for use in handling buoys at Agency Depots.

SPECIAL EQUIPMENT

The new seven-foot aluminum lantern recently developed by departmental engineers has now been adopted as standard equipment and these new lanterns were installed at 15 stations during 1955-56. With the assistance of National Research Council scientists, further development of the new type "B" diaphone is continuing and results to the present are promising. The use of radar reflectors on buoys has proven satisfactory and a new type of radar reflector which forms part of the buoy superstructure was designed giving greater strength and reliability.

BUOYS

More than 6,200 buoys including light and fog signal buoys, floats, dolphins and unlighted buoys are maintained on charted positions throughout the shipping season. In areas where navigation closes for the winter, buoys are lifted and stored and at strategic points specially designed ice buoys are placed for the benefit of late shipping. The maintenance of buoys and the constant checking of their positions is carried on by Masters and Officers of departmental vessels and inspecting officers from the District Marine Agencies.

Some additional 5,000 minor buoys, bushes, stakes, etc., are maintained in secondary channels and isolated locations by contract arrangement. In 1955-56 there were 425 contracts in force and these minor services are checked periodically by Agency inspecting officers.

PUBLIC HARBOURS

There are 319 public harbours proclaimed under the Canada Shipping Act controlled by the Department, 148 of which are in charge of Harbour Masters who enforce the Public Harbours Regulations framed by the Division and authorized by the Governor in Council. The Regulations, substantially unchanged over many years, were completely redrafted in 1954 and included an upward revision in charges and dues to bring them into line with present day conditions. The Harbour Masters enforce the Regulations and collect harbour dues which in 1955-56 totalled \$178,055, an increase of \$77,059 over the previous year. Harbour Masters are usually paid a portion of their collections but there are a few on fixed salaries.

HARBOURS ADMINISTERED BY HARBOUR COMMISSIONERS

There are seven Harbour Commissions as follows:

Belleville, Hamilton and Toronto in Ontario;

Winnipeg-St. Boniface, Manitoba;

New Westminster, North Fraser and Port Alberni in British Columbia.

General supervision is exercised over the affairs of the Harbour Commissioners and all by-laws are submitted for approval of the Department before submission to the Governor in Council for confirmation. The Commissioners make by-laws concerning navigation, rates, tolls, penalties, etc. They also administer water lot transactions affecting Federal property within the harbours, the accruing rental forming part of the harbour revenue.

WATER LOTS AND LANDS

At Confederation title to the beds of public harbours was vested in the Federal Crown by the British North America Act but the boundaries were not clearly defined. In British Columbia an agreement was reached with the Province defining the harbours of Victoria, Esquimalt, Nanaimo, Alberni, Burrard Inlet and New Westminster as public harbours and also defining their limits. In Ontario, negotiations have been carried on for some time and it has been tentatively agreed to consider 27 harbours as Federal property. Survey plans and descriptions of Ontario harbours are being prepared by the Real Estate Division and considerable progress has been made in this work looking forward to a formal agreement with the Province. In all other provinces the bed of each harbour is considered separately as to Federal or Provincial jurisdiction.

Parcels of harbour bed property, known as water lots, are leased for wharf sites, booming grounds and other structures built below high water mark. These transactions involve close liaison with the Department of Public Works in that Department's administration of the Navigable Waters Protection Act, Part I. Leases are also granted for lighthouse lands not immediately required but for which there is expected to be future use. In 1955-56, 201 leases were in effect and total rental collected was \$19,163.

GOVERNMENT WHARVES

Public wharves are constructed by the Department of Public Works and administered by the Department of Transport under the Harbours and Piers Act. The Minister of Transport appoints wharfingers who apply the regulations under the Act and collect wharfage dues. There are at present over 2,500 wharves, piers, breakwaters, etc., under administration, 503 of which are in charge of wharfingers who are paid from fees collected. The Government Wharves Regulations were completely redrafted and a revised schedule of rates and charges was brought into effect in 1954 bringing up to date a tariff

that had remained unchanged since 1893. Special rates apply at the wharves at Sorel, Que., Sault Ste. Marie, Ont., and at Westview and Nanaimo, B.C. The general tariff of tolls and dues applies at all other Government wharves. The administration of these wharves involves problems of leases, construction, storage and berthing rates, and the control of traffic. Wharfage collections in 1955-56 amounted to \$621,808, an increase of \$160,389 over the preceding year.

ICEBREAKING, THUNDER BAY, ONT.

The ports of Port Arthur and Fort William and approaches were again opened by icebreakers to accommodate early spring shipping through Sault Ste. Marie Canal and were kept open in the fall until the close of navigation. This work was done by contract which includes responsibility for placing Lake Superior lightkeepers on their stations for the opening of navigation and their removal when the shipping season closes for the winter.

PUBLICATIONS

The annual *List of Lights and Fog Signals* in four volumes—Newfoundland, Atlantic, Inland and Pacific—containing up-to-date data on all lights and fog signals was published. In addition, *Notices to Mariners* were issued almost daily covering changes in marine aids to navigation and other matters of importance to mariners. These Notices are published in three groups—Atlantic, Inland and Pacific—and in form are as near as practicable to the form adopted by the International Hydrographic Bureau. They are issued by mail free of charge and during the year approximately 1,500 copies of each Atlantic notice, 1,400 of each Inland notice, and 1,000 copies of each Pacific notice were distributed. *Radio Notices to Mariners* are printed and distributed separately.

Notices to Shipping covering matters of an urgent nature are issued by the District Marine Agents for their respective districts and are broadcast through the appropriate coastal and Great Lakes radio stations. Items other than those of a temporary nature are later covered by *Notices to Mariners*. During 1955-56, 160 Notices to Mariners covering 490 items were issued.

Respectfully submitted,

W. J. MANNING,
Chief of Aids to Navigation.

NORMAN WILSON, Esq.,
Director, Marine Services,
OTTAWA.

TABULAR REPORT OF AIDS TO NAVIGATION

STATEMENT BY DISTRICTS, SHOWING THE NUMBER OF LIGHTS OF THE SEVERAL ORDERS, LIGHTSHIPS, LIGHTKEEPERS, FOG SIGNALS, BUOYS, ETC.,
FOR THE FISCAL YEAR ENDED MARCH 31, 1956.

District	1st Order Lights	2nd Order Lights	3rd Order Lights	4th Order Lights	5th Order Lights	6th Order Lights	7th Order Lights	Gas Beacons	Pressed Lens and others	Catoptric Lights	Electric Lights	Total Lights	Lightships	Lightkeepers	Diaophones	Explosive Signals	Fog Whistles
St. John's, Nfld.	2	11	1	20	1	.....	177	8	43	263	.....	173	43	.....	1
Saint John, N.B.	4	3	25	19	26	59	.....	.....	14	42	194	1	134	26	1	.....
Halifax	2	8	30	15	17	35	17	18	58	29	232	2	121	22	1	2
Charlottetown	6	7	36	7	12	36	28	41	178	28	381	.....	185	23	1	.....
Quebec	9	20	11	23	39	20	78	163	47	413	2	168	30	2	6
Sorel	2	1	3	5	2	11	7	199	59	289	.....	87	.....	.....	.....
Prescott	5	20	13	7	31	.....	92	43	119	330	.....	32	16	.....	2
Parry Sound	5	6	21	5	6	12	46	76	54	95	326	.....	61	41	1	3
Kenora	4	2	3	2	32	43	.....	1	.....	.....	.....
Selkirk	3	.....	4	.....	10	10	6	33	.....	9	.....	.....	.....
Victoria	3	.....	3	10	5	1	8	88	18	15	170	321	1	34	29	.....	4
Prince Rupert	3	3	.....	1	10	58	15	2	64	157	.....	16	12	.....	1
Northwest Territories	1	.....	.....	.....	.....	.....	.....	13	5	6	26	50	.....	2	.....	.....	.....
Hudson Strait and Bay	4	6	.....	.....	2	12	.....	.....	.....	1	.....
Totals	12	17	48	177	82	118	245	291	540	752	762	3,044	6	1,003	242	7	19

TABULAR REPORT OF AIDS TO NAVIGATION

STATEMENT BY DISTRICTS, SHOWING THE NUMBER OF LIGHTS OF THE SEVERAL ORDERS, LIGHTSHIPS, LIGHTKEEPERS, BOG SIGNALS, BUOYS, ETC.,
FOR THE FISCAL YEAR ENDED MARCH 31, 1936

District	Sirens	Fog Bells and Tylon	Hand Fog Horns	Hand Fog Bells	Total Fog Signals	Fog Signal Stations only	Gas or Electric Buoys	Gas or Electric and Whistle Buoys	Lighted Bell Buoys	Whistling Buoys	Bell Buoys	Total Gas and Signal Buoys	Lighted Spar Buoys, Floats and Dolphins	Unlighted Buoys	Stakes, Buoys and Balises	Unlighted Dolphins, Spindles and Beacons
St. John's, Nfld.	1	1	1	1	46	8	22	6	2	7	39	30	130	130	430	2
Saint John, N.B.	19	17	17	1	64	5	15	15	23	20	59	99	884	884	1,089	60
Halifax	7	50	50	3	82	2	20	33	51	20	59	183	221	221	1,620	29
Charlottetown	1	10	10	3	38	1	24	8	13	4	11	60	878	878	1,620	4
Quebec	3	1	25	3	70	1	108	1	36	36	11	145	87	87	1,620	228
Sord.	1	5	4	1	29	1	202	113	5	1	1	202	883	883	13	61
Prescott	3	8	8	3	59	6	48	8	12	1	3	63	516	516	88	3
Perry Sound	1	6	6	1	6	2	2	2	2	1	1	9	70	70	1	96
Kenora	13	13	13	2	50	25	25	10	8	1	2	46	154	154	144	11
Selkirk	5	5	5	1	19	1	10	10	7	7	7	20	42	42	35	35
Victoria	1	1	1	1	1	1	6	6	1	1	1	6	84	84	84	11
Prince Rupert	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Northwest Territories	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Hudson Strait and Bay	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Totals	5	54	124	13	464	17	588	83	157	32	115	975	98	5,144	3,449	673

NAUTICAL DIVISION

SIR,—I have the honour to submit the annual report for Nautical Division for the fiscal year ended March 31, 1956.

Nautical Division controls the following activities at Ottawa and throughout Canada:

Registration and licensing of ships.

Measurement of ships for tonnage.

Publication of the *Canadian List of Shipping* and quarterly supplements, and the *Report on Navigation Conditions on the Hudson Bay route from the Atlantic Seaboard to the Port of Churchill*.

Negotiations with shipowners and underwriters regarding marine insurance.

Pilotage.

Government Navigation Schools, and assistance given to Navigation Schools maintained by Provincial education authorities.

Examination and Certification of Masters and Mates.

Certification of Ships' Cooks.

Shipping Masters.

Examination and Certification of Able Seamen.

Medical Examination of Seafarers.

Relief, maintenance and repatriation of distressed seamen.

Central Register of Seamen.

Port Wardens, Authorized Surveyors of Timber Deck Cargoes, and Inspector of Live Stock Shipments.

Receivers of Wreck, and Salvage.

Preliminary Inquiries, and the preparation of Formal Investigations into marine casualties.

Lifesaving stations on the Atlantic and Pacific coasts.

Awards to seamen and others for brave conduct in the saving of life from vessels in distress.

Issue of ribbons and medal awards to merchant seamen in recognition of service at sea during the Second World War and in the Korean Campaign.

REGISTRATION OF SHIPS

The recording, registry, and tonnage measurement of ships, and the licensing of vessels exempt from registry are administered under Part I of the *Canada Shipping Act* by the Registry of Shipping. Collectors of Customs, who are also Registrars of Shipping at 73 ports of registry, supervise recording, registry and licensing transactions. In addition, vessel licences for small craft exempt from registry are issued by other Customs Officers throughout the country.

Measuring Surveyors report on the dimensions and tonnage of vessels for registry purposes, and send tonnage forms to headquarters for inspection. During the year ending March 31, 1956, 1,325 tonnage measurement forms were checked. In addition, headquarters staff measured 15 vessels in Canada for tonnage.

The *List of Shipping* containing names, official numbers, dimensions, ton-nages, ownerships, etc., of all vessels on Canadian registry is a publication of the Registry of Shipping. It is a standard reference work, available free of charge to Government Departments and may be purchased by the general public from the Queen's Printer, Ottawa.

In accordance with the provisions of the British Commonwealth Merchant Shipping Agreement, 1931, the Registrar General of Shipping and Seamen in the United Kingdom was supplied with particulars of ships registered during the year. Information as to approximately 4,547 separate transactions involving first registry, no re-registry, registry anew, transfers and transmissions of ownership, mortgages, and changes of name, together with details of all vessels registered during this period was supplied to the Registrar General for use in compiling the "Mercantile Navy List and Maritime Directory", which shows particulars of all vessels registered in the Commonwealth.

From April 1, 1955, to March 31, 1956, the sum of \$9,948 was realized from fees charged for various types of registry transactions. During 1955, 26,584 small vessels exempt from registry were licensed under the Small Vessel Licensing Regulations, making a total of 119,845 vessel licences issued throughout Canada to December 31, 1955.

During 1955, 1,119 vessels were added to Canadian registry, and 499 removed, making a net gain of 620 for the year. As of December 31, 1955, there were 17,188 vessels of 2,316,396 gross tons registered in Canada. The following table shows the number of vessels by Provinces:—

	Ships	Tons		Ships	Tons
Newfoundland.....	1,094	84,032	Manitoba.....	108	14,095
Nova Scotia.....	5,026	133,784	Saskatchewan.....		
Prince Edward Island.....	320	14,695	Alberta.....	7	630
New Brunswick.....	1,188	58,353	British Columbia.....	5,323	520,282
Quebec.....	2,016	715,607	Yukon Territory.....	16	4,413
Ontario.....	2,083	770,179	N.W. Territories.....	7	326

Total: 17,188 ships; 2,316,396 gross tons

HUDSON BAY ROUTE

Ocean-going vessels made a total of 38 voyages to Churchill, Man., during the season of navigation 1955. These voyages were made by 27 vessels, 10 of which made two voyages and one made three voyages. *La Hacienda* was the first in history to make three consecutive voyages to Churchill in one season.

The S.S. *Warkworth*, of the Dalgliesh Line, Newcastle on Tyne, England, was the first merchant ship to arrive at Churchill, on July 27. The S.S. *Triland*, of British registry, berthed at Churchill on October 8, and left for the United Kingdom on October 10, and was the last ship out.

There were only two vessels reporting damage sustained while steaming through the ice in the vicinity of Hudson Strait. The S.S. *Warkworth* had her propeller blades and some of her bow plating slightly damaged; the C.G.S. *Edward Cornwallis* damaged her bow plating.

Reports from masters were very favourable respecting ice information, aids to navigation, and general conditions of navigation into the Strait and Bay.

MARINE INSURANCE

Previous to the navigation season of 1955 on the Hudson Bay route, marine underwriters amended the Hudson Bay scale of additional premiums to the extent of permitting a vessel to leave the last loading port on or before but not later than October 15, with a proviso that extensions up to October 20 at scale rates be surcharged by 25 per cent.

The critical dates had previously been October 10 and October 15 leaving the last loading port.

PILOTAGE

Pilotage in Canada is governed by the provisions of Part VI of the *Canada Shipping Act*, and the function of this Division is to supervise the activities of the various Pilotage Districts with a view to ensuring efficient pilotage service within the framework of the provisions of the Act.

Under the Act, the Governor in Council may create Pilotage Districts and constitute Pilotage Authorities, and any Pilotage Authority so constituted has the power to enact by-laws which, upon approval by the Governor in Council, fix pilotage tariffs and the method of remuneration of pilots, provide for pension funds, and control in general the method of operation of the Pilotage District concerned.

PILOTAGE DISTRICTS FOR WHICH THE MINISTER OF TRANSPORT IS THE PILOTAGE AUTHORITY

The Minister of Transport is the constituted Pilotage Authority for each of the Pilotage Districts as follows: Sydney, Bras d'Or Lakes, Halifax, Saint John, Quebec, Montreal, St. Lawrence-Kingston-Ottawa, British Columbia and Churchill. In each of these Districts the Minister is responsible, through the Department and its local Superintendents, for all details of operation, including the operation and maintenance of pilot vessels and stations, the collection and distribution of pilotage dues, and the licensing and discipline of pilots. The pilots are remunerated out of the Pilotage Funds of the respective Districts, such Funds being composed of monies received from the shipowners for pilotage services. The pilots are not Government servants although they are supervised and controlled by the Government. The by-laws in each District require the annual election by the pilots of a Pilots' Committee which represents the pilots, in their dealings with the Pilotage Authority, in all matters concerning them individually and collectively.

There were 313 licensed pilots engaged in pilotage in these nine districts during the fiscal year and they performed 32,939 pilotages inward or outward and 9,259 movages in the course of which there were 145 casualty reports made by pilots covering instances of an unusual nature whether or not damage was involved. This number represents $\frac{1}{3}$ of 1 per cent of the pilotage jobs performed. A gross amount of \$3,021,990.30 was earned in pilotage fees during the year.

PILOTAGE DISTRICTS UNDER LOCAL AUTHORITIES

There are thirty-three Pilotage Districts for each of which the Pilotage Authority is a local body appointed by the Governor in Council. These Pilotage Authorities govern their respective Districts according to the provisions of the *Canada Shipping Act*, and are required by Section 332 of that Act to transmit to the Minister of Transport, at the end of each fiscal year, pilotage returns containing such particulars as the Minister from time to time directs.

In the case of these Districts, details of administration are in the hands of the local Pilotage Authorities. However, when the Department learns, through the annual returns or otherwise, that administration is not in accordance with the provisions of the *Canada Shipping Act*, the local Pilotage Authority is informed accordingly and advice and guidance are provided in the matter. Further, any amendments to the by-laws of these Districts must be processed by the Department for submission to Council.

PILOTAGE DISTRICTS IN NEWFOUNDLAND

The Pilotage Districts which existed in Newfoundland at the time of union continue to be governed by the provisions of the Statutes of Newfoundland, Part VI of the *Canada Shipping Act* not having been proclaimed in effect in that Province.

The situation with regard to these Districts is similar to that of Pilotage Districts governed by local Pilotage Authorities in the other Provinces, except that the governing legislation is different from Part VI of the *Canada Shipping Act*.

PILOTAGE IN LABRADOR

The Department employed during the navigation season three pilots to assist ships into and out of Goose Bay, Labrador, when required.

NAVIGATION SCHOOLS

At Quebec, Que., and Prince Rupert, B.C., navigation schools were fully maintained by the Department in the winter months only. The school at Prince Rupert gives instruction chiefly for the benefit of operators of small vessels.

Financial aid was provided in support of navigation schools under local education authorities at Halifax, N.S., Saint John, N.B., Montreal, Que., Kingston, Ont., and Vancouver, B.C.

Other navigation schools are maintained by local education authorities and other organizations at: St. John's, Nfld., Grindstone, Rimouski and Montreal, Que., and Toronto, Midland, Collingwood and Owen Sound, Ont.

MASTERS, MATES AND SEAMEN

There were 707 examinations held for Masters, First Mates and Second Mates Certificates of Competency and Service. In addition, 209 examinations were held in form and colour vision.

A total of 278 Masters, 86 First Mates, and 94 Second Mates were issued with certificates.

One hundred and sixty-three renewals of Temporary Masters Certificates were issued for which no examinations were held.

In addition and under the provisions of Section 137 of the *Canada Shipping Act*, 171 Masters, 6 First Mates and 1 Second Mate were granted permission to sail for a limited time while holding inferior qualifications as prescribed by the Act.

Fees for Masters and Mates examinations and issue of Certificates of Qualification as Able Seaman amounted to \$6,860.

Thirteen seamen received Certificates of Qualification as Ships' Cooks, and 52 received Certificates of Qualification as Able Seamen.

Accounts received in connection with the relief, maintenance and repatriation of seamen left behind at ports abroad amounted to \$322 of which \$165 was collected from the owners of the ships.

Assistance was given in the settlement of 24 estates of deceased seamen with a total value of \$4,578.

At 76 ports in Canada, there were during the year 43,292 engagements and 41,030 discharges of seamen from ships of British registry.

CENTRAL REGISTER OF SEAMEN

CALENDAR YEAR 1955

Terminated Articles of Agreement and Official Log-Books received in the Central Register of Seamen	1,259
Ports at which Continuous Discharge Books issued	107
Continuous Discharge Books issued	4,748
Seamen's Identity Certificates issued	1,697
Entries transferred from terminated Articles of Agreement to Index Cards	46,780
Statement of sea service compiled at the request of seamen	202
Enquiries received regarding missing seamen, identification of seamen and tracing of next of kin	384

PORT WARDENS, AUTHORIZED SURVEYORS OF TIMBER DECK CARGOES, AND INSPECTOR OF LIVE STOCK SHIPMENTS

Cargoes of grain shipped in Canada for overseas ports were loaded under the supervision of port wardens in accordance with the *Grain Loading Regulations* made under authority of the *Canada Shipping Act*. The activities of all port wardens, Authorized Surveyors of Timber Deck Cargoes, and Inspector of Live Stock Shipments were supervised throughout the year with most satisfactory results.

Seventy-eight plans of grain loading arrangements, forwarded to the Department for approval, for ships which expect to load grain in Canada, were inspected and approved.

During the season of navigation 1955, 220 head of cattle and 26 horses were shipped from Montreal under the supervision of the Inspector of Live Stock Shipments; as in the previous year, the majority of this live stock was shipped through tropical zones under the provisions of the revised *Live Stock Shipping Regulations*. Reports indicate that shipments arrived in very satisfactory condition and no undue mortality was recorded.

PRELIMINARY INQUIRIES AND FORMAL INVESTIGATIONS INTO MARINE CASUALTIES

During the fiscal year, twelve preliminary inquiries into marine casualties were held under the provisions of the *Canada Shipping Act*.

SALVAGE SUBSIDIES

Arrangements were entered into for a new contract with Foundation Maritime Limited for a further period of two years, commencing with the navigation season of 1956, for the provision and maintenance of a salvage and wrecking plant complete for service in the River and Gulf of St. Lawrence at an annual subsidy of \$75,000.

The contract with Pacific Salvage Limited for a subsidy of \$75,000 per annum entered into in 1954 was in effect during the fiscal year 1955.

LIFESAVING STATIONS

Three Lifesaving Stations are maintained by the Nautical Division. One is located at Clayoquot, B.C., one at Banfield, B.C., while the other is at Bay View, N.S. Each station is equipped with a modern 36'8" self-righting motor-lifeboat. Twenty-one full-time crew members are employed at the three stations. In addition, one full-time patrolman and two seasonal patrolmen are employed on the West Coast Trail (Banfield to Pachena, to Tsusiat to Carmanah—a 35 mile trail) to assist in keeping the trail clear of fallen timber, the repairing of bridges and the patrolling of the beach.

The lifeboats at Banfield and Clayoquot were completely overhauled during the fiscal year.

Respectfully submitted,

F. S. SLOCOMBE,
Chief, Nautical Division

N. WILSON, Esq., M.E.I.C.,
Director, Marine Services,
OTTAWA.

MARINE AGENCIES

Ten District Marine Agencies are maintained, in addition to which, in order to service adequately secondary interior waters, three Sub-Agencies are in operation under the District Marine Agent at Parry Sound. These are located at Port Arthur and Kenora in Ontario, and Selkirk, Manitoba. The affairs of the Marine Services Branch in Northwest Territories are handled by the Department of Northern Affairs and National Resources through their District Administrator at Fort Smith, N.W.T.

The territorial limits of the District Marine Agencies and their principal officials are as follows:

OFFICIALS

St. John's, Nfld.

District Marine Agent,
R. J. RANDELL
Superintendent of Lights,
R. E. STONE

Charlottetown, P.E.I.

District Marine Agent,
E. K. MACNUTT
Engineer,
L. E. SLAGHT.
Superintendent of Lights,
F. G. OSBORNE

Halifax, N.S.

District Marine Agent,
J. C. THEAKSTON
Engineer,
J. E. FORBES
Superintendent of Lights,
C. G. WILLIAMS

Saint John, N.B.

District Marine Agent,
J. M. M. LAMB
Superintendent of Lights,
F. A. MCKINNON
Engineer,
G. L. SMITH

Quebec, P.Q.

District Marine Agent,
G. E. GAUDREAU
Engineer,
P. BOUSQUET
Superintendent of Lights,
J. A. OUELLET

Sorel, P.Q.

District Marine Agent,
J. H. BEAUCHEMIN
Engineer,
J. P. LEROUX

DISTRICT

The coast of Labrador east and north of, but not including, Camp Island; the coast of Newfoundland from, but not including, Cape Bauld; south and east to Cape Race, and thence westward along the South Shore of the Island to and including Port aux Basques. From coastal waters of Prince Edward Island and the Mainland from Cape St. Lawrence, N.S., and Strait of Canso south to the Canso Causeway; to Shippigan, N.B., and on the North Shore from Natashquan Point to Camp Island and Belle Isle; the Magdalen Islands and the west coast of Newfoundland from Cape Ray northward to and including Cape Bauld.

The coastal waters of Nova Scotia (Atlantic seaboard) from Cape Sable to Cape St. Lawrence, including the Bras d'Or Lakes, the Strait of Canso north to the Canso Causeway, and St. Paul's Island, N.S.

The coastal waters of the Bay of Fundy from the International Maine Boundary to Cape Sable, N.S., including the Saint John River system.

The Gulf and River St. Lawrence on the North Shore from Natashquan Point, Que., to Portneuf above Quebec, Que., including the Saguenay River to Chicoutimi; on the South Shore from Shippigan, N.B., to Point Platon, Que.; Anticosti Island, and also Hudson Bay and Strait.

The River St. Lawrence from Portneuf above Quebec, Que., to the Soulanges Canal at the head of Lake St. Louis; the Richelieu River to the International Boundary and the Ottawa River to Ottawa.

OFFICIALS

DISTRICT

Prescott, Ont.
District Marine Agent,
J. S. BARRICK
Superintendent of Lights.

Parry Sound, Ont.
District Marine Agent,
F. K. McKEAN
Engineer,
E. M. CHILDERHOSE

Marine Sub-Agent,
Port Arthur, Ont.
E. O. ORMSBY

Marine Sub-Agent,
Kenora, Ont.
C. L. PARROTT

Marine Sub-Agent,
Selkirk, Man.
H. PAYNE

Vancouver, B.C.
District Marine Agent,
K. DIXON

Prince Rupert, B.C.
District Marine Agent,
N. A. BEKETOV

Fort Smith, N.W.T.
District Administrator,
(Dept. of Northern Affairs and
National Resources),
L. A. C. O. MUNT

The Upper St. Lawrence River, Lake Ontario, Lake Erie, Detroit River, Lake St. Clair and St. Clair River to Sarnia, Ont.; the Ottawa River above Ottawa, including Lake Timagami.

Lake Huron, Georgian Bay and Lake Superior to the International Boundary, and secondary inland lakes.

Northern part of Lake Superior and Lake Nipigon.

Rainy Lake, Rainy River, Lake of the Woods and other lakes in the vicinity.

Lakes Winnipeg and Winnipegosis.

The coastal waters of British Columbia from the Canadian International Boundary on the south to Cape Caution, B.C., including Vancouver Island; the inland waters of British Columbia, south of a line from Cape Caution to Latitude 55°N., Long. 120°W.

The northern portion of British Columbia Coast from Cape Caution, B.C., to the International Boundary at the north, including Queen Charlotte Islands; the inland waters of British Columbia, north of a line from Cape Caution to Lat. 55°N., Long. 120°W.; Yukon Territory.

The Mackenzie River Water Route from Waterways, Alta., to the Arctic, including Lakes Athabaska, Great Slave and Great Bear.

The District Marine Agents represent the Department in matters pertaining to the Marine Services Branch within the districts defined above, which encompass the coastline and all the navigable inland waters of Canada. They direct and administer activities pertaining to the construction, operation and maintenance of aids to navigation, the operation of Marine Services ships, the administration and maintenance of Government wharves, public harbours and lifesaving stations, the supervision of icebreaking by contract or by Government ships, except in the St. Lawrence River.

Assistance is given in the collection of weather and ice data for the Meteorological Service. Buildings for the Marine Radio Aids to Navigation are built and maintained by the Agencies and their personnel. Materials and supplies are transported.

Marine Services ships are attached to and operated from the District Marine Agencies. Workshops are maintained for minor repairs to these ships and for the manufacture and repair of Aids to Navigation equipment. These facilities are available to other branches of the Department of Transport, and, on occasion, to other departments.

Marine Agencies function as supply depots for construction purposes for aids to navigation, equipment and supplies, and for Marine Services ships and other Government services, and for supplies required for the Hudson Bay Patrol and Government stations in the Far North.

RIVER ST. LAWRENCE SHIP CHANNEL

SIR,—The St. Lawrence Ship Channel Division is responsible for the design, construction and maintenance of a deep draught channel for ocean shipping throughout the two hundred miles from deep water below Quebec to Montreal, together with the necessary anchorages and turning areas and certain major approach channels to wharves.

Icebreaking, from December through April, between Anticosti and Lake St. Louis above Montreal, as well as in the Saguenay, is carried out under the direction of the Division. The report of the Assistant Chief Engineer covering this phase of our activities will be found hereunder.

Survey and inspection vessels of the Ship Channel fleet with auxiliary floating equipment are manned and maintained, except for major repairs, under the direct supervision of our Administrative Officer.

The staff and plant of the Ship Channel are also made available for large maintenance and capital dredging operations carried out for the National Harbours Board on the St. Lawrence and at and below Chicoutimi on the Saguenay. Work is also done occasionally at Lauzon for the Department of Public Works.

The submerged weirs in the Sorel Islands are inspected periodically. Erosion, when it occurs, is studied and remedial works carried out.

CONSTRUCTION

(Details of dredging will be found in tables hereunder).

By the end of the season of 1955 the original 1952 dredging contract was almost completed, with but a small amount of work remaining at St. Augustine and St. Antoine. In addition, to make full use of the available dredging fleet not engaged at these two localities, three additional items were added to the contract, of which one, Pointe Citrouille Curve, was completed, one, Nicolet Traverse, well advanced, and the third, Three Rivers (shoal removal) commenced. The uncompleted additional items will form part of a new contract but the remaining work at St. Augustin and St. Antoine will continue to be part of the 1952 Contract which has still one year to run.

All things considered, the accomplishment of the contract fleet this past season was commendable.

(Details of Capital (Construction) dredging follow:—

Head of Lake St. Peter—This item, comprising the full length of Boat Island Channel, was completed to a new width of 800 feet.

Nicolet Traverse—Widening was carried out here, supplementing the work done previously at Nicolet Curve, and next season should see the work completed, under a new contract.

Three Rivers—Removal of the lower portion of the shoal between North and South Channels was commenced. When dredging is completed, downbound vessels will be able to turn and approach Three Rivers wharves directly. The work, an addition to the 1952 contract in 1955, will be completed as part of a new contract.

Annual reports of historical and technical interest are: Department of Transport or Marine and Fisheries reports dated 1947-48, P.42; 1928-29, P.27; 1911-12, P.88; and 1906, Append. 3.

Becancour Shoals—These shoals were removed, thus opening Becancour Lower Traverse to a width of 800 feet.

Pointe Citrouille Curve—Further widening was completed as an addition to the 1952 Contract.

Batiscan—The new anchorage was completed.

St. Antoine—Here, the discovery of an uncharted shoal in deep water resulted in some changes in alignment and a better, straighter widened channel; but some additional dredging was required and the work will be completed only next season.

St. Augustin—Some very large boulders at the lower end of this channel caused some difficulty and prevented completion of the widening to 800 feet last season. Here, too, work should be concluded next summer.

MAINTENANCE

A general examination of the dredged portions of the Ship Channel was made during the season and close sweeping was carried out in sand filling areas, both above and below Quebec. Less maintenance dredging than usual was required between Three Rivers and Quebec to maintain the available 35 foot depth at low water, and in the East Narrows area below Quebec we once again were able to offer a 30-foot minimum at low tide.

Maintenance sweeping for the National Harbours Board was carried out as usual at Three Rivers, Que., and in the channel below Chicoutimi.

WATER LEVELS

Once again water levels remained at a satisfactory height during the season of navigation with a high of 11'11" in April and a low of 2'1" in September.

MARINE REPORTING SERVICE

During the season the service worked in co-operation with Pilotage which had taken over the Three Rivers and Sorel stations. The replacement of the private leased telephone line by a teletype circuit caused initial awkwardness but at the end of the season service given the public was about equal to that offered before the change and in some particulars with improvement still proceeding the service was better.

One duty of importance is ice reporting. This was carried out in satisfactory fashion, due largely to the Pilotage putting their two stations at our disposal and under our orders for operation during the winter months.

FUTURE OPERATIONS

The St. Lawrence Ship Channel Committee 1954 consisted of the following:—C. S. Booth, Assistant Deputy Minister, Chairman; F. S. Jones, Chief Engineer, St. Lawrence Ship Channel; W. J. Manning, Chief of Aids to Navigation; H. B. MacCarthy, Assistant Chief Engineer, National Harbours Board; and C. W. West, Member of the St. Lawrence Seaway Authority.

This committee has presented its report recommending continued improvement of the Ship Channel, stating the respective responsibilities of the Ship Channel and National Harbours Board for engineering and dredging works in areas where both organizations operate, and approving continued research and planning in these areas where industrial development will cause added demands for terminal facilities, channels and turning areas.

This report, coupled with and amplified by departmental policy includes in one considerable project the completion of the widening of the channel to an 800-foot minimum between the lower limit of Montreal Harbour and Quebec in ten years. Two additional years will be required to complete the Montreal Harbour area from Longue Pointe to Varennes when development plans are available.

With a long term project determined, the committee has recommended and the Department is seeking to secure the addition to the Ship Channel organization of two survey and inspection vessels and four civil engineers. When these are available, considerable preparatory survey and research activities will be undertaken, and the maintenance sweeping of all dredged areas will be carried out each year, a process of the highest urgency, with steamers of greater size and draught already entering the St. Lawrence trade. The present fleet consists of three survey and inspection vessels, two sounding scows and one stonelifter working throughout the season, supplemented by the part time services of the small icebreaker *Ernest Lapointe*. This equipment has not proved sufficient to cope with the increasing work of this Division.

ICEBREAKING

The winter of 1955-56 was marked by a very cold December, followed by moderate weather in January and February and a return to low temperatures in March and well into April. Ice formed in the St. Lawrence River before the end of November. Considerable difficulty was experienced in clearing late shipping from the Lachine Canal. By December 16, when the departure of the *S.S. Maria de Larrinaga* officially closed the Port of Montreal to ocean traffic, much broken ice was running between Montreal and Quebec.

The C.G.S. *N. B. McLean* completed her escort of late sailings from Quebec on December 21. The C.G.S. *Ernest Lapointe*, after a supply trip to Grosse Ile for the Canadian Army Research and Development Establishment on December 20, joined the *N. B. McLean* in an effort to prevent the heavy accumulation of broken ice from interrupting the ferry service in Quebec, while the C.G.S. *d'Iberville* was engaged in keeping Lake St. Peter open.

On December 23, after several days of extreme temperatures reaching a minimum of 20 degrees below zero, a jam formed at Quebec Bridge, concurrently with the stopping of the ice from the middle of Lake St. Peter to Sorel. At the latter place ferry service had already been suspended for two days on account of drifting ice.

Working alone, the *d'Iberville* was unable to keep the escape channel open and at the same time clear the rapidly growing ice accumulation above Lake St. Peter. By January 2 the ice had consolidated as far as Montreal Harbour.

In the meantime the *d'Iberville* was despatched to help the two other ships at Quebec Bridge, where there was danger of the jam extending upstream due to the constant addition of broken ice from above. The jam was broken on December 27. During the clearing of the deeply rafted ice through the Port of Quebec the *N. B. McLean* was engaged in assisting the ferries. To prevent a recurrence of a jam at the bridge, the *d'Iberville* widened critical areas between Quebec and Three Rivers. The *Ernest Lapointe*, after minor engine repairs, resumed work on Lake St. Peter. During the absence of the *N. B. McLean* from December 31 to January 6 while assisting shipping at Charlottetown, the *d'Iberville* remained in Quebec. Detained by snowstorms after the return of the *N. B. McLean*, the *d'Iberville* was unable to join the *Ernest Lapointe* on Lake St. Peter until January 10. On January 22 the *Walter E. Foster* of Saint

John Agency was added to the icebreaker strength on Lake St. Peter. The clearing of the channel to Sorel on January 24 permitted the resumption of ferry service at that point. The C.G.S. *Safeguarder* acted as interim ferry until the channel was clear enough for the regular ferry on January 30.

There was no flooding on the south shore opposite Montreal, although there were two very brief surges, 19'6" above low water datum on January 13 and 19'4" on January 25. On the latter date minor flooding of basements was reported in Laprairie, but this was of very short duration.

On February 1 the *N. B. McLean* left for Sydney for service in the Gulf and Maritimes. She was replaced in Quebec by the C.G.S. *Saurel*.

The channel was opened to Montreal East on February 8. After a delay on account of jams on Lake St. Peter, the *d'Iberville* broke through to Victoria Pier on February 24.

A 16-inch snowfall on March 8 added to the difficulties of clearing jams and caused interruptions in the Sorel-St. Ignace ferry service. On April 2, although large quantities of ice still remained in the river, the *S.S. Manchester Regiment* reached Montreal under icebreaker escort, to open the port for the season. The river was considered safe for daylight navigation, with caution, on April 13. On this date 24 ships left inbound from Quebec, where they had been delayed during the congestion of the channel following a general breakup of shore ice. Three icebreakers provided escort at critical places.

During February the *Saurel* made two emergency trips to assist winter navigation below Quebec. The *Ernest Lapointe* made a supply trip to Grosse Ile on March 4. On March 12 the *Ernest Lapointe* and the *Walter E. Foster* brought the damaged ferry *Radisson* from Three Rivers to Lauzon drydock. The ferry was escorted back to Three Rivers on March 20.

RIVER ST. LAWRENCE SHIP CHANNEL CONTRACT DREDGING DETAILS,
SEASON, 1955

1955	Locality	Cu. Yds. removed Pl. meas.	Cost	Material	Nature of work	Extent of com- pletion (Cost basis)
			\$ cts.			%
	<i>1952 Contract Capital</i>					
	Head of Lake St. Peter. . . .	227,918	182,334 40	Clay, sand, stones. .	Widening.	Com- pleted
	Nicolet Traverse.	457,000	754,050 00	Clay, sand, stones, boulders, hardpans	Widening.	Com- pleted
	Three Rivers.	24,789	55,437 80	Clay, stones, boul- ders	Removal of Shoal	Com- pleted
	Becancour Shoals.	121,713	340,796 40	Hardpan, sand, clay, boulders, some shale.	Widening.	Com- pleted
	Pte. Citrouille Curve.	319,719	354,888 09	Sand.	Widening.	Com- pleted
	Batiscan.	490,833	358,308 09	Sand, some clay and some shale.	Anchorage.	Com- pleted
	St. Antoine.	428,776	943,307 20	Clay, stones hard- pan, boulders.	Widening.	82%
	St. Augustin.	22,290	48,815 10	Clay, stones, hard- pan, boulders.	Widening.	98%
	Total (Capital Dredging) . . .	2,093,038	3,037,937 08			
1955	<i>Maintenance</i>					
	Maintenance, Montreal- Quebec, inclusive.	75,187	109,021 15			

Saguenay River—The *d'Iberville* commenced breaking ice in the Saguenay River on March 23, working on a 24-hour basis. On April 2 the S.S. *Sunrell* arrived at Port Alfred to open that harbour to ocean shipping.

Lachine Canal opened on April 16. The service of the *Ernest Lapointe* was required to clear the ice at the upper end of Lake St. Louis.

RIVER ST. LAWRENCE SHIP CHANNEL—CONTRACT DREDGING SUMMARY

CLOSE OF SEASON, 1955.

—	Quantity Dredged Cubic Yards Pl. Measure	Cost	Remarks
<i>Capital</i>		\$ cts.	
1930 Contract.....	5,406,741	10,774,583 35	Completed.
Fairchild Airport.....	108,567	186,133 70	Original Contract from Montreal Harbour Commissioners.
Wolfe's Cove.....	555,659	185,017 47	Original Contract from Quebec Harbour Commissioners.
1934 Extension.....	13,681,514	6,641,892 48	Completed.
1935 Extension.....	3,780,718	5,620,128 30	Completed.
1937 Extension.....	15,419,811	12,870,671 70	Completed.
1947 Contract.....	12,744,440	15,021,504 58	Completed.
1952 Contract.....	10,214,925	14,276,851 88	
Total (Capital).....	61,912,375	65,576,783 36	
<i>Maintenance</i>			
1947 Contract.....	1,088,798	1,604,173 42	
1952 Contract.....	388,605	560,377 25	
Total (Maintenance)....	1,477,403	2,164,550 67	

Respectfully submitted,

PAUL KUHRING,
Chief Engineer.

N. WILSON, Esq.,
Director, Marine Services,
OTTAWA.

SHIPS AND FLOATING EQUIPMENT

Herewith report of this Division for the fiscal year ended March 31, 1956. The work falls under four general headings:—

- Operation of Ships and Maintenance
- New Construction
- Northern Transportation
- Aerial Ice Survey

OPERATION OF SHIPS AND MAINTENANCE

The Department's fleet, consisting of approximately 80 units, comprises lighthouse supply and buoy vessels, icebreakers, lightships, weatherships, miscellaneous tugs, lightering equipment and barges.

During the year repair contracts were completed on about half of these vessels totalling \$1,552,724.00.

Major repairs this year were carried out on the C.G.S. *Chesterfield*, *Grenville*, *Dollard*, and *Edward Cornwallis*

The annual maintenance and overhaul of the ship to shore lightering equipment, 35 items in all, at Coral Harbour, Fort Chimo, Winisk and Great Whale River were carried out under the supervision of H. Caines.

Personnel of Marine Service Steamers now consists of 238 Deck and Engineering Officers, and 782 Petty Officers and Ratings, totalling 1,020. The increase in personnel is due in general to the requirement for more Relief Officers as a result of the 40-hour week, and for more men in the Northern Operations.

The Division is responsible for manning, storing and operating 28 ocean-going ships.

The total estimated value of these 28 units today is approximately \$23,000,000 and the total expenditure during the fiscal year 1955-56 was \$6,768,056.

The tug, *J. D. Weir*, was used as a pilot tender at Goose Bay, Labrador.

Four icebreakers were used for icebreaking in the Saguenay, Gulf of St. Lawrence and the Maritimes. This work was also in part carried out by ice-breaking buoy ships. The icebreaking operations in the Saguenay were completed with the arrival of the *d'Iberville* at Quebec on April 7. A large number of icebreaking assignments were carried out at ports on the lower part of the River St. Lawrence, on both the north and south shores of the Gulf, at Summerside and Charlottetown, P.E.I., Pictou, N.S., at Botwood, Cornerbrook, Port aux Basques and generally in Newfoundland, at Sheet Harbour, Bridgewater and miscellaneous ports on the Nova Scotia coast, also in the Bay of Chaleur and at Caraquet and Shippigan, N.B. Icebreaking operations were also carried out at Sydney where the *N. B. McLean* was stationed throughout the winter.

The C.G.S. *St. Catharines* and C.G.S. *Stonetown*, which operate the Pacific Ocean Weather Station "P", maintained a regular schedule on a six-week rotation basis.

NEW CONSTRUCTION

The programme of new construction on hand during the year was as follows:

The Cabot Strait auto ferry *William Carson*, built by Canadian Vickers Limited, Montreal, and the Yarmouth-Bar Harbor auto ferry *Bluenose*, built by the Davie Shipbuilding Limited, Lauzon, Que., were accepted by the Department and handed over to the Canadian National Railways for operation on August 8 and December 13 respectively.

The *Prima Vista* single screw diesel engine work boat for service at Goose Bay, Labrador, was built by Lunenburg Foundry and Engineering Limited, Lunenburg, N.S., and delivered to the Department in January, 1956.

A lighthouse supply and buoy vessel being constructed by Burrard Dry Dock Company Limited, North Vancouver, B.C., for service at the Victoria Agency, was launched February 28, 1956, and named the *Sir James Douglas*. Delivery is expected in November, 1956.

A contract was awarded to Davie Shipbuilding, Limited, for the construction of a lighthouse supply and buoy vessel for service at the Quebec Agency. The delivery of this vessel is expected for the fall of 1957.

A contract was awarded to Davie Shipbuilding Limited for the construction of an icebreaker, lighthouse supply and buoy vessel for service at the Quebec Agency, in replacement of the C.G.S. *Lady Grey*. The delivery of this vessel is expected in January, 1957.

The design plans and specifications were completed covering a survey vessel for River St. Lawrence Ship Channel Services, for the construction of a lighthouse supply and buoy vessel for service at Parry Sound Agency, and for the construction of a sounding vessel for River St. Lawrence.

A contract was awarded to Geo. T. Davie & Sons Limited, Lauzon, Que., for the construction of a lightship for the Halifax Agency. Good progress was made on the construction during the year and delivery is expected in November, 1956.

Progress was made with the conversion of the frigate *St. Stephen* by Victoria Machinery Depot Limited, Victoria, B.C., and work should be completed by the end of November, 1956.

Contracts were awarded to Lunenburg Foundry & Engineering Limited, Lunenburg, N.S., for the construction of a pilotage vessel for Halifax, N.S., and for a work boat for Port Arthur, Ont.

CONSTRUCTION FOR NORTHERN OPERATIONS

No. of Units	Type	Length	Shipyard	Delivery Date
1	Ville class steel diesel tug.....	40'	Ferguson Industries Ltd.....	19/7/55
6	Powered steel barges.....	30'	Pictou, N.S.....	6/55
8	Powered steel barges.....	30'	Davie Shipbuilding Ltd.....	6/55
6	Non-powered steel barges.....	32'	Lauzon, Que.....	6/55
2	Twin screw power barges (LCM)...	50'	.....	27/7/55
1	Twin screw power barge (LCM)...	50'	S. G. Powell Shipyard Ltd., Dunville, Ont.	6/7/55
2	Non-powered steel barges.....	32'	Imperial Welding Co., Sault Ste. Marie, Ont.	24/6/55
2	Powered steel barges.....	30'	Canadian Shipbuilding & Engineer- ing Co., Collingwood, Ont.	17/6/55

In addition, two 30-foot powered steel barges were built by S. G. Powell Shipyard Ltd., Dunnville, Ont., and will be ready early next year; and a contract was awarded in January, 1956, to Russel-Hipwell Ltd., Owen Sound, Ont., for the construction of two 40-foot steel diesel tugs which will be ready for the 1956-57 season.

NORTHERN TRANSPORTATION

The first departmental vessel to proceed to the North this year was the *Ernest Lapointe*, which sailed for Goose Bay and Hamilton Inlet with 30 tons of needed supplies for the Department of Transport Agency there. Buoys and aids to navigation were also placed in position.

On June 25, the *C. D. Howe* left Montreal to undertake her sixth annual Eastern Arctic resupply voyage with 39 passengers and 670 tons of general cargo. On June 26, both the *Edward Cornwallis* and the *N.B. McLean* sailed from Montreal for the North, the former with 525 tons of general cargo and two passengers and the latter with 550 tons of cargo and 13 passengers. The *C.D. Howe* returned to Quebec on October 31, the *Edward Cornwallis* to Halifax on September 26, and the *N.B. McLean* to Quebec on November 22.

The *d'Iberville* sailed from Wolfe's Cove wharf, Quebec City, on July 31, formed convoy with the *S.S. Gander Bay* and *M.V. Maruba*, and proceeded down the St. Lawrence heading for Resolute Bay and Padloping Island. Approximately 200 tons of cargo and aids were put on board at Montreal and Quebec along with 58 passengers. The ship returned to Quebec on September 25, completing a voyage of 7,000 miles.

Later in the year the *Ernest Lapointe* returned to Goose Bay, sailing from Montreal on November 3, 1955, with 30 tons of cargo. In addition to her cargo consignments, she lifted summer buoys, assisted late shipping, and carried return cargo to Sorel.

In addition to the government vessels, eight commercial ships carried 20,158 tons of general cargo to various stations in the North. All this cargo was delivered successfully.

ANNUAL ICE SURVEY

The annual spring investigation of ice conditions in the River and Gulf of St. Lawrence and waters adjacent to the Maritimes and Newfoundland was again carried out by aerial survey, working in close co-operation with the International Ice Patrol. Beginning on March 2, 1955, flying hours on the survey totalled 91.

An experimental aerial survey of ice conditions was also conducted during the shipping season in the Hudson Bay, which proved very helpful to vessels in and out of the port of Churchill, Man. Beginning on July 10, 94 hours were flown on the survey.

A. WATSON,
Chief Departmental Ships' Operations
and Construction.

BOARD OF STEAMSHIP INSPECTION

SIR,—I have the honour to submit the annual report of the Board of Steamship Inspection for the fiscal year ended March 31, 1956.

The Board of Steamship Inspection is responsible for the administration of certain parts of the *Canada Shipping Act*, which include

- (a) the examination and approval of plans showing the construction of steamships, their machinery and equipment
- (b) the inspection of steamships during construction
- (c) the periodical inspection and certification of steamships
- (d) the inspection of ships' tackle
- (e) the examination of candidates for certificates of competency as engineer
- (f) the application of the Regulations respecting the Carriage of Dangerous Goods in ships.

The Board also prepares regulations setting out standards of construction for ships, their hulls, machinery, and equipment, and for their safe operation, and also regulations for the carriage of dangerous goods.

Certain small vessels are exempt from inspection under the Act but are subject to some of the statutory regulations. The work of checking these vessels to see that the regulations are being complied with is carried out by the Royal Canadian Mounted Police, who report irregularities to the Department for action.

Steamship Inspection Service offices are maintained at St. John's, Nfld; North Sydney and Halifax, N.S.; Saint John, N.B.; Quebec, Sorel and Montreal, Que.; Kingston, Toronto, St. Catharines, Collingwood, Midland and Port Arthur, Ont.; and Vancouver and Victoria, B.C.

In addition, Inspectors of Ships' Tackle are stationed at the ports of St. John's, Nfld.; Halifax, N.S.; Saint John and Dalhousie, N.B.; Charlottetown and Summerside, P.E.I.; Quebec and Montreal, Que.; and Vancouver, Victoria, Prince Rupert, Chemainus and Port Alberni, B.C.

The Board has undertaken the task of developing schools for marine engineers at the ports of St. John's, Nfld., Halifax, N.S., Rimouski and Montreal, Que., and Toronto, Ont., in conjunction with the provincial Departments of Education in the provinces concerned, except in the case of the school at Toronto which is operated by the Dominion Marine Association. New engineering laboratory equipment has been added this year to the schools at Toronto and St. John's.

Further to the development of schools for marine engineers, the Board has also undertaken a small training programme for marine engineer apprentices, the purpose being to train young men for positions in the Department and on government ships requiring technically trained marine engineers.

The Board is working closely with the Departments of Education of the provinces with respect to the courses of instruction to be made available to the boys taking part in the departmental apprenticeship training scheme.

In 1954 the Chairman of the Board of Steamship Inspection attended the International Conference for the Prevention of Pollution of the Sea by Oil. Legislation providing for the approval of the Convention which resulted from this Conference, together with legislation aimed at curbing the nuisance of oil pollution from ships in the territorial waters of Canada, is now being prepared.

The Board has conducted an intensive survey of the oil pollution problem in the territorial and inland waters of Canada in order to decide on the extent of prevention measures and the provision of reception facilities for waste oil from ships in our main ports.

Shipbuilding has been fairly active in shipyards throughout the country during the past year, with a falling-off towards the end of the year. The construction of wooden fishing vessels of the seiner, dragger and long liner types continues at a fair pace.

There has been some lake type tonnage constructed in the United Kingdom for Canadian owners, notably canal types.

Annual inspection has been made of 1681 steamships with an aggregate gross tonnage of 1,700,312 tons. Ninety-three new ships were constructed and completed under inspection, including bulk carriers for Great Lakes service, ferries and many ships for the various types of fishing such as trawlers, draggers and long liners.

One canal-size ship for Great Lakes service and one large train and automobile ferry were built in the United Kingdom and these ships, on arrival in Canada, were inspected.

Eleven ships were converted or reconditioned and were inspected during conversion or reconditioning before going into commission.

Twenty-three ships were inspected after being transferred from foreign registry and one ship after transfer from registry in the United Kingdom.

The revision of the Steamship Inspection regulations is practically completed, there being two regulations yet to be done, the Hull Construction Regulations and the Life Saving Equipment Regulations. These regulations are now in draft form and are being discussed with the shipping industry. The new Regulations respecting the Construction and Inspection of Fishing Vessels and those respecting the Carriage of Dangerous Goods in Ships have been very well received by sections of the shipping industry to whom they are of interest.

The Board has given considerable attention during the past year to the setting up of standards for lifejackets, vests and cushions for use in small craft. This work was done in conjunction with representatives of the manufacturers of lifesaving equipment.

In conjunction with the Nautical Services Division the Board has produced a small booklet entitled *Safety Afloat* which contains much useful information for those putting out in small craft. There has been a great demand for this booklet by the public and a new revised edition containing further useful information will be issued.

During recent years inflatable life rafts have been developed in Europe and in the case of several foundering have been the means of saving life. With a view to obtaining a knowledge of this type of equipment the Board has acquired a 7-person inflatable raft and is subjecting it to extensive tests prior to consideration of its approval as statutory lifesaving equipment.

Certificates of competency as engineer were granted to 233 candidates for steam certificates, 214 for motor certificates, 50 combined steam and motor certificates, also one combined steam and motor certificate of United Kingdom validity. Temporary certificates were granted to 284 engineers and 12 renewals were issued. Five steam certificates were endorsed to permit the holder to act as engineer in motorships. Thirteen motor certificates were endorsed to permit the holder to act in steamships.

Permits were issued to 714 engineers under the provisions of Section 137 of the Canada Shipping Act.

Respectfully submitted,

ALAN CUMYN,
Chairman, Board of Steamship Inspection.

J. R. BALDWIN, Esq.,
Deputy Minister of Transport,
OTTAWA.

TABLE SHOWING THE NUMBER OF VESSELS INSPECTED, FEES COLLECTED, ETC., DURING THE YEAR ENDED MARCH 31, 1956

Division	Number of vessels inspected with gross tonnage		Number of vessels not inspected, with gross tonnage		Total number of vessels subject to inspection when in commission, with gross tonnage		Number of vessels added to Canada, with gross tonnage		Number of vessels lost, broken up or destroyed, with gross tonnage	
	Vessels registered or owned in Canada		Vessels registered or owned elsewhere		No.	Gross Tons	No.	Gross Tons	No.	Gross Tons
	No.	Gross Tons	No.	Gross Tons						
St. John's.....	91	14,036	.....	.....	91	14,036	.....	.....	.....	.....
North Sydney.....	37	12,408	3	1,096	43	589	.....	.....	16	10,346
Halifax.....	196	126,357	.....	.....	252	6,100	.....	.....	21	2,972
Saint John, N.B.....	42	11,362	17	102,641	60	43	.....	.....	7	859
Quebec.....	158	84,163	1	387	334	6,834	.....	.....	8	2,136
Sorel.....	66	36,695	.....	.....	175	7,844	.....	.....	.....	.....
Montreal.....	116	172,967	.....	.....	22	1,571	.....	.....	4	553
Kingston.....	98	151,012	.....	.....	25	.....	.....	.....	2	669
Toronto.....	171	387,134	.....	.....	98	.....	.....	.....	.....	.....
St. Catharines.....	60	186,691	.....	.....	177	8,041	.....	.....	.....	.....
Collingwood.....	56	83,000	.....	.....	60	.....	.....	.....	4	201
Midland.....	74	148,613	.....	.....	60	136,691	.....	.....	2	141
Port Arthur.....	51	20,540	.....	.....	60	89,811	.....	.....	.....	.....
Vancouver.....	371	83,118	.....	.....	85	149,309	.....	.....	2	630
Victoria.....	69	70,713	.....	.....	133	29,324	.....	.....	1	25
			1	7,459	411	103,622	.....	.....	6	1,076
			.....	.....	82	73,166	.....	.....	.....	.....
Totals.....	1,659	1,588,729	22	111,583	2,311	1,763,223	119	63,596	57	9,262

According to Departmental Records, the following fees have been collected on account of Steamship Inspection Service—1955-56.

Sales—Publications.....	\$ 353.30
Sundry Services.....	6,119.93
Annual Fees.....	115,914.71
Incidental Fees.....	32,059.75
Engineer Examination Fees.....	3,939.25
Plans.....	2,533.04
Refund previous year's expenditure.....	582.15
	161,502.14

RAILWAY SERVICES

SIR,—I have the honour to submit the following report on the administration and financial matters dealt with by the Railway section during the fiscal year ended March 31, 1956.

CANADIAN NATIONAL RAILWAYS

The operations of the Canadian National Railways for the calendar year 1955 produced a surplus of \$10,717,689 after the payment of fixed charges, compared with a deficit of \$28,758,098 in 1954. This surplus was paid to the Government and applied as a dividend on the company's 4 per cent non-cumulative preferred stock, which represented a dividend of slightly over 1.3 per cent on the 4 per cent preferred stock of the company held by the Government of Canada at December 31, 1955.

Funds provided Canadian National Railways by the Government of Canada fiscal year 1955-56—

Equity Capital

4 per cent preferred stock of the Canadian National Railway Company purchased by the Government, under the provisions of the Canadian National Railways Capital Revision Act, 1952, being 3 per cent of the gross revenues of the System from March 1, 1955 to February 29, 1956	\$ 21,087,654.00
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Loans and Advances

Canadian National Railways' Financing and Guarantee Act, 1955—	
Capital expenditures and temporary advances to Trans-Canada Air Lines	\$ 12,500,000.00
Canadian National Railways Refunding Act, 1951—	
Redemption of maturing or callable securities	84,084,101.64
Canadian National Railways Refunding Act, 1955—	
Redemption of maturing or callable securities	54,499,651.36
Total loans and advances	\$151,083,753.00
Loans and advances repaid	1,500,000.00 \$149,583,753.00

CANADIAN NATIONAL (WEST INDIES) STEAMSHIPS, LIMITED

The deficit of the Canadian National (West Indies) Steamships, Limited, for the calendar year 1955, amounted to \$95,964 compared with a deficit of \$628,410 in 1954, a reduction of \$532,446. Funds to cover the deficit were provided by the Government and absorbed into the Consolidated Deficit Account.

In addition to the improvement in the operating position of the Company in 1955, there was a reduction of \$207,771 in interest charges arising out of the refunding of the Company's Bond issue, which matured on March 1, 1955, and a non-recurrent profit of \$53,853 was realized from the liquidation of security holdings in connection with this refinancing. During the fiscal year, the Company repaid \$200,000 of the Government loan for the redemption of the Company's Bond Issue leaving a balance of \$1,800,000 outstanding at March 31, 1956.

HUDSON BAY RAILWAY

The deficit in the operation of the Hudson Bay Railway for the fiscal year 1955-56 amounted to \$208,084.14, compared with \$382,038.64 in 1954-55, a decrease of \$173,954.50. A total of 578,415 tons of revenue freight was handled in 1955-56, an increase of 120,504 tons over the previous year. Approximately 80 per cent of the freight tonnage handled consisted of wheat for export. Some 15,129,467 bushels or 453,884 tons were moved by the railway during the year, an increase of 2,510,434 bushels over the previous year, which was the largest quantity of grain handled by the railway since the Port of Churchill was opened. During the year, 36,237 passengers were carried compared with 31,474 in the previous year, an increase of approximately 15 per cent. A summary statement of the operating results of the railway fiscal years 1935-36 to 1955-56 appears under Appendix No. 1 to this report.

Capital expenditures during the year amounted to \$190,306.17. The capital work consisted of installation of 150,000 rail anchors, rebuilding of four wooden bridges, purchase of a new dragline, track motor cars and several minor additions and betterments to the roadway and buildings. The total capital cost of the Hudson Bay Railway to March 31, 1956 amounted to \$34,373,353.14 and is exhibited in Appendix No. 2 to this report.

PRINCE EDWARD ISLAND CAR FERRY AND TERMINALS

The deficit in the operation of the Prince Edward Island Car Ferry and Terminals for the calendar year 1955 amounted to \$1,624,639. The S.S. *Prince Edward Island* was operated as a second ferry from June 15 to November 5, and from November 20 to November 30. The S.S. *Scotia No. 1* was also operated in this service for 33 days during the period the M. V. *Abegweit* was in dry-dock for annual overhaul. The ferries made 5,948 single crossings, carrying 335,261 passengers, 717,854 tons of revenue freight, 16,812 trucks and buses and 106,541 automobiles. Highway vehicles handled in 1955 increased by approximately 17 per cent over the previous year.

A summary statement of the operating results of this service appears under Appendix No. 3 to this report.

CABOT STRAIT FERRY SERVICE

In addition to the regular service operating between North Sydney, N.S., and Port aux Basques, Nfld., the new ferry M.V. *William Carson* was operated between North Sydney, N.S., and Argentia, Nfld., from August 23, 1955. This is only a temporary freight service pending completion of improvements to the harbour at Port aux Basques. In addition to the above in order to relieve the congestion of freight moving through North Sydney, N.S., consigned to Newfoundland, it was necessary to provide additional ships on a temporary basis to operate between North Sydney and other Newfoundland ports. This temporary service was started on September 1, 1955.

The deficit in the operation of the service, including the temporary freight service between North Sydney, N.S., and Argentia, Nfld., and North Sydney, N.S., and other Newfoundland ports, arising in the calendar year 1955 amounted to \$3,471,630.

DOCKS AND TERMINALS

North Sydney, N.S.—Expenditure on the new terminal facilities at this point amounted to \$36,275 during the fiscal year 1955-56, making a total expenditure of \$3,505,317 on the new facilities and equipment to March 31, 1956.

Port aux Basques, Nfld.—Expenditures by this Department on the new terminal facilities amounted to \$352,481 in 1955-56, the major items being the installation of pipe lines to the dock, construction of roadway and parking lot, acquisition of land and the purchase of freight handling equipment. The total expenditure on the new terminal and equipment to March 31, 1956, amounted to \$5,419,704.

YARMOUTH, N.S.—BAR HARBOR, MAINE, FERRY SERVICE

The M.V. *Bluenose*, built by Davie Shipbuilding Limited, was delivered in December 1955 and commenced operations between Yarmouth and Bar Harbor on January 4, 1956. The operation and management of the ferry service on behalf of Her Majesty are entrusted to the Canadian National Railway Company under authority of Order in Council P.C. 1955-48/408 of March 21, 1955.

The Department of Public Works constructed the Yarmouth Terminal for this service. The Town of Bar Harbor provided the dock site at Bar Harbor free of charge and the State of Maine provided \$1,000,000 towards the cost of the new terminal, subject to equal annual repayments over a period of 30 years to amortize the amount without interest; the additional amount of \$750,000 required to complete the Terminal was provided by the Canadian Government on the same terms and conditions.

During the fiscal year the Government of Canada provided a loan of \$350,000 to complete the Bar Harbour Terminal, making a total amount of \$750,000 provided for this purpose. In addition to the above, a loan of \$200,000 was made by the Government of Canada to the Canadian National Railways to provide working capital for operation of the service.

Under the terms of the entrusting order, the Government is required to pay deficits accruing from the operation and in the event of the operations resulting in a surplus the amount must be remitted to the Government.

CONSTRUCTION OF TWO NEW SHIPS FOR NEWFOUNDLAND COASTAL STEAMSHIP SERVICE

In 1952 a contract was let in the United Kingdom for the construction of two new ships to be operated by the Canadian National Railways in the Newfoundland Coastal Steamship Service. The ships are all steel construction powered by diesel engines, length 210 feet, breadth 34 feet, gross tonnage 1200 approximate speed, 20 knots. The first ship, M.V. *Bonavista*, was delivered at St. John's, Nfld., on May 10, 1956, and the second ship, the M.V. *Nonia*, on July 10, 1956.

Expenditure on the two ships to March 31, 1956, amounted to \$1,296,198 and the estimated total cost of the two vessels delivered at St. John's, Nfld., is \$2,242,400.

STRAIT OF CANSO CAUSEWAY

The construction of a causeway across the Strait of Canso between Cape Porcupine and Balache Point in the Province of Nova Scotia, which was commenced in 1952, was sufficiently complete in May 1955 to permit the operation of trains and highway vehicles over the Causeway.

A considerable amount of construction work remained to be carried out after the opening of the Causeway for traffic and during the fiscal year 1955-56 construction expenditure amounted to \$2,918,979 mainly for the construction of the navigation lock, lock gates and machinery, relocation of the railway, and paving of the highway. The total expenditure on the project to March 31, 1956, amounted to \$18,843,485. It is expected that all construction work will be completed by December 31, 1956.

APPENDICES

The Appendices and their arrangement are listed below as a convenient reference.

1. Hudson Bay Railway Income Account-Fiscal years 1935-36 to 1955-56.
2. Hudson Bay Railway-Investment in road and equipment to March 31, 1956.
3. Prince Edward Island Car Ferry and Terminals Income Account—Calendar Years 1933 to 1955.

Respectfully submitted,

F. T. COLLINS,
Special Assistant and Secretary.

J. R. BALDWIN, Esq.,
Deputy Minister of Transport,
OTTAWA

HUDSON BAY RAILWAY

APPENDIX No. 1

INCOME ACCOUNT

	Fiscal Years 1935-36 to 1948-49	Fiscal Year 1949-50	Fiscal Year 1950-51	Fiscal Year 1951-52	Fiscal Year 1952-53	Fiscal Year 1953-54	Fiscal Year 1954-55	Fiscal Year 1955-56	Aggregate March 31st, 1956
	\$	\$	\$	\$	\$	\$	\$	\$	\$
	cts.	cts.	cts.	cts.	cts.	cts.	cts.	cts.	cts.
Railway Operating Revenues.....	6,686,591 67	1,619,492 67	1,929,292 95	2,226,971 40	2,300,142 01	2,430,080 46	2,706,730 45	3,481,549 31	23,380,850 92
Railway Operating Expenses.....	9,583,955 87	1,510,374 47	1,771,017 72	1,968,664 65	2,151,570 42	2,295,843 87	2,500,854 88	2,921,132 97	24,703,414 85
Net Revenue from Railway Operations	2,897,364 20	109,118 20	158,275 23	258,306 75	148,571 59	134,236 59	205,875 57	560,416 34	1,322,563 93
Railway Tax Accruals.....	30,348 67	7,566 92	13,337 15	12,289 42	12,739 09	12,784 89	13,049 80	14,528 41	116,644 35
Railway Operating Income.....	2,927,712 87	101,551 28	144,938 08	246,017 33	135,832 50	121,451 70	192,825 77	545,887 93	1,439,208 28
Rent from Passenger Train Cars.....	271 78	.....	.....	2,100 60	.....	3,809 20	6,881 00	12,501 00	271 78
Rent from Work Equipment.....	2,899 74	.....	.....	16,125 00	17,415 00	17,915 00	18,060 00	16,550 00	28,664 24
Joint Facility Rent Income.....	127,868 50	12,530 00	15,240 00	222,681 19	254,360 44	294,311 65	353,368 73	448,936 41	241,703 30
Hire of Freight Cars—Debit Balance.....	722,779 10	145,335 95	200,778 06	200,778 06	123,649 68	129,494 26	182,467 50	244,869 16	2,642,551 53
Rent for Locomotives.....	732,143 05	99,556 43	129,671 00	132,156 41	123,649 68	129,494 26	182,467 50	244,869 16	1,774,007 49
Rent for Passenger Train Cars.....	173,368 60	35,418 63	28,364 65	41,527 49	40,032 77	35,028 74	45,039 59	49,727 66	448,508 13
Rent for Work Equipment.....	359,155 12	31,385 54	30,387 07	27,509 17	28,434 40	23,375 88	28,877 97	45,329 67	574,454 32
Net Railway Operating Income.....	4,784,418 72	197,615 27	229,022 70	159,631 33	292,456 99	339,034 13	391,987 02	213,923 97	6,608,090 13
Miscellaneous Rents Income.....	1,447 28	421 80	602 26	1,385 50	4,933 20	5,397 10	9,948 38	5,839 83	29,975 35
Net Income or Loss.....	4,782,971 44	197,193 47	228,420 44	158,245 83	287,523 79	335,637 03	382,038 64	208,084 14	6,578,114 78

NOTE: The Net Income or Loss does not include provision for Interest on the Capital Investment for Road and Equipment.

DEPARTMENT OF TRANSPORT

HUDSON BAY RAILWAY

INVESTMENT IN ROAD AND EQUIPMENT (RAILWAY ONLY)

APPENDIX No. 2

Classification of Expenditure	Total Construction Cost to March 31, 1955	Expenditures Fiscal Year 1955-56	Total Expenditure to March 31, 1956
	\$ cts.	\$ cts.	\$ cts.
I. Road			
1. Engineering.....	2,294,985 14		2,294,985 14
2. Land for transportation purposes.....	70,544 72		70,544 72
3. Grading.....	10,132,050 36		10,132,050 36
6. Bridges, trestles and culverts.....	2,572,789 82	61,851 78	2,634,641 60
8. Ties.....	3,315,633 50	433 10	3,316,066 60
9. Rails.....	2,945,585 85	1,898 52	2,947,484 37
10. Other track material.....	850,272 59	70,906 31	921,178 90
11. Ballast.....	3,972,390 90		3,972,390 90
12. Track laying and surfacing.....	3,783,288 95	9,704 59	3,792,993 54
13. Fences, snowsheds and signs.....	33,419 53		33,419 53
16. Station and office buildings.....	476,215 32	8,557 85	484,773 17
17. Roadway buildings.....	272,382 00		272,382 00
18. Water stations.....	581,428 08	3,328 53	584,756 61
19. Fuel stations.....	102,665 14		102,665 14
20. Shops and engine houses.....	960,608 06	93 50	960,701 56
26. Telegraph and telephone lines.....	573,061 84		573,061 84
27. Signals and interlockers.....	468 46		468 46
31. Power transmission systems.....	5,616 68		5,616 68
35. Miscellaneous structures.....	7,439 50		7,439 50
37. Roadway machines.....	106,151 39	33,216 43	139,367 82
38. Roadway small tools.....	25,631 77	315 56	25,947 33
40. Revenue and operating expenses during construction.....	706,954 84		706,954 84
43. Other expenditure—Road.....	40,551 73		40,551 73
44. Shop machinery.....	54,928 85		54,928 85
Total Road.....	33,885,065 02	190,306 17	34,075,371 19
II. Equipment			
57. Work equipment.....	109,134 49		109,134 49
58. Miscellaneous equipment.....	4,443 94		4,443 94
Total Equipment.....	113,578 43		113,578 43
III. General Expenditures			
72. General officers and clerks.....	131,027 19		131,027 19
73. Law.....	4,647 89		4,647 89
74. Stationery and printing.....	13,277 96		13,277 96
77. Other expenditures—General.....	35,450 48		35,450 48
Total General Expenses.....	184,403 52		184,403 52
Total Construction Cost.....	34,183,046 97	190,306 17	34,373,353 14

PRINCE EDWARD ISLAND CAR FERRY AND TERMINALS

INCOME ACCOUNT

APPENDIX No. 3

Year	Operating Revenues	Operating Expenses	Net Revenue from Operations	Interest on Unfunded Debt	Net Income Deficit Contributed by Government
	\$ cts.	\$ cts.	\$ cts.	\$ cts.	\$ cts.
1933.....	122,768 40	405,694 26	282,925 86	5,218 32	288,144 18
1934.....	93,506 81	471,982 58	378,475 77	5,466 23	383,942 00
1935.....	89,338 71	443,641 13	354,302 42	6,031 94	360,334 36
1936.....	96,606 97	393,846 73	297,239 76	6,200 13	303,439 89
1937.....	104,675 91	431,679 89	327,003 98	6,283 36	333,287 34
1938.....	110,955 27	492,223 60	381,263 33	6,375 25	387,643 58
1939.....	124,607 22	544,805 74	420,198 52	6,655 53	426,854 05
1940.....	131,286 49	584,194 07	452,907 58	7,865 90	460,773 48
1941.....	145,050 11	562,930 88	417,880 77	5,769 98	423,650 75
1942.....	115,575 67	700,863 99	585,288 32	5,807 04	591,095 36
1943.....	140,429 30	832,987 12	692,557 82	5,807 04	698,364 86
1944.....	163,240 86	920,666 14	757,425 28	15,958 38	773,383 66
1945.....	184,187 19	859,773 39	675,586 20	12,214 24	687,800 44
1946.....	205,019 22	1,080,303 27	875,284 05	12,680 20	887,964 25
1947.....	257,797 23	1,175,984 68	918,187 45	13,668 51	931,855 96
1948.....	300,123 54	1,504,711 25	1,204,587 71	15,293 04	1,219,880 75
1949.....	324,673 88	1,529,581 40	1,204,907 52	16,322 20	1,221,229 72
1950.....	361,341 01	1,611,003 36	1,249,662 35	17,276 86	1,266,939 21
1951.....	447,957 00	1,795,802 00	1,347,845 00	17,441 00	1,365,286 00
1952.....	487,295 00	1,989,558 00	1,502,263 00	17,504 00	1,519,767 00
1953.....	528,085 00	2,113,233 00	1,585,148 00	17,707 00	1,602,855 00
1954.....	527,993 00	2,024,078 00	1,496,085 00	18,123 00	1,514,208 00
1955.....	607,539 00	2,214,010 00	1,606,471 00	18,168 00	1,624,639 00

NOTE: This account maintained separately to comply with Order-in-Council P.C. 904, dated May 16, 1933.

FINANCIAL SERVICES DIVISION

Summary statements showing expenditures made and revenues received during the fiscal year 1955-56 form a part of this report. The total amount expended in the year was approximately \$136,000,000 including about \$11,700,000 from funds provided by Department of National Defence and other government departments. Most of the latter expenditure was for the purchase of land, improvements to airport properties, and meteorological services provided to the Defence Forces.

The total expenditure was approximately \$25,000,000 lower than the previous year, mainly because in 1955-56 there was no C.N.R. deficit, which amounted to \$28,750,000 in 1954-1955. The following items represent major decreases in expenditures over previous years:—

- (1) River St. Lawrence Ship Channel Service—Contract Dredging (approximately \$1,000,000)
- (2) Construction of new dock and terminal facilities at Port aux Basques, Nfld. (approximately \$1,800,000)
- (3) Construction of auto-ferry vessels (approximately \$4,700,000)
- (4) Canadian National Railways—Deficit (approximately \$28,750,000)
- (5) Strait of Canso—Transportation Improvements and Facilities (approximately \$6,300,000)

The above decreases are partially offset by the following major increases:—

- (1) Construction Work—Airports (approximately \$10,000,000)
- (2) Railway Grade Crossing Fund (approximately \$1,600,000)
- (3) Construction of Vessels for Newfoundland Coastal Services (to be operated by C. N. Rlys.) (approximately \$1,100,000)
- (4) Subsidy to C.N.R. re Cost of Constructing a Railway Line in Northern Quebec between St. Felicien, Chibougamau and Beattyville (approximately \$1,250,000)
- (5) Expenditures for construction work from funds provided by other Government Departments (approximately \$2,000,000)

The revenue from all sources reached a total of approximately \$11,700,000 as compared with \$11,500,000 for 1954-55, the Canal and Marine Services accounting for the major increases. Air Services revenues were down approximately \$600,000 mainly due to decreased revenue in the Government Telegraph and Telephone Service amounting to approximately \$1,800,000, on account of the sale of the British Columbia facilities in 1954-55, but the decrease is partially offset by greater revenues from Aircraft Landing Fees, Concessions, etc. amounting to approximately \$1,200,000. Canal Services revenue was up approximately \$500,000 mainly due to greater revenue from wharf-ages and rentals, also the sale of surplus land previously purchased in connection with the construction of the Atwater Tunnel under the Lachine Canal. Marine Services revenue was up approximately \$250,000 mainly due to greater revenue from wharf rentals and harbour dues.

SUMMARY OF EXPENDITURES AND REVENUES
FISCAL YEAR 1955-56

	Expenditures	Revenues
	\$ cts.	\$ cts.
Departmental Administration.....	1,671,204 59	4,889 76
Air Services.....	57,287,050 72	8,345,890 51
Canal Services.....	8,311,724 76	2,163,611 99
Marine Services.....	20,565,344 85	928,605 32
Railway and Steamship Services.....	23,463,121 59	184,489 09
Miscellaneous Services.....	13,426,065 32	28,035 17
Total—Departmental expenditures and revenues.....	124,724,511 83	11,655,521 84
Expenditures made by Department of Transport from funds provided by other departments or agencies.....	11,672,032 65	.....
Grand Total.....	136,396,544 48	11,655,521 84

DEPARTMENT OF TRANSPORT

STATEMENT OF EXPENDITURES, BY APPROPRIATIONS
FISCAL YEAR 1955-56

	\$	cts.
DEPARTMENTAL ADMINISTRATION—		
Minister's Salary and Motor Car Allowance.....	17,000	00
Departmental Administration.....	1,495,855	36
The St. Lawrence River Joint Board of Engineers—Canadian Section.....	154,889	23
Miscellaneous Civil Service Gratuities.....	3,460	00
TOTAL—DEPARTMENTAL ADMINISTRATION.....	1,671,204	59
AIR SERVICES—		
Administration Division—		
Administration.....	670,123	04
Construction Services Administration.....	793,273	61
Total—Administration Division.....	1,463,396	65
Civil Aviation Division—		
Control of Civil Aviation.....	1,035,411	77
Airways and Airports—		
Operation and Maintenance.....	9,081,301	11
Airway and Airport Traffic Control.....	1,922,645	41
Construction or Acquisition of Buildings, Works, Land and New Equipment	20,381,452	29
Exchequer Court Awards.....	1,000	00
Contributions to Other Governments or International Agencies for the Operation and Maintenance of Airports.....	220,282	90
Contributions to Assist Municipalities in the Development of and Improvements to Airports.....	80,097	00
Contributions towards Airport Development and other Airport Projects on Cost-Sharing Basis.....	80,509	58
Grants to Organizations for the Development of Civil Aviation.....	301,750	00
Total—Civil Aviation Division.....	33,104,450	06
Telecommunications Division—		
Airways and Airports—Radio Aviation Services—		
Administration, Operation and Maintenance.....	5,874,174	16
Construction or Acquisition of Buildings, Works, Land and New Equipment	2,508,437	15
Radio Act and Regulations—		
Administration, Operation and Maintenance.....	1,555,992	41
Construction or Acquisition of Buildings, Works, Land and New Equipment	196,257	29
Radio Aids to Marine Navigation—		
Administration, Operation and Maintenance.....	2,274,286	54
Construction or Acquisition of Buildings, Works, Land and New Equipment	477,454	34
Telegraph and Telephone Service—		
Administration, Operation and Maintenance.....	444,870	83
Construction or Acquisition of Buildings, Works, Land and New Equipment	299,046	64
Northwest Communication System—		
Construction or Acquisition of Buildings, Works, Land and New Equipment	704,789	77
Total—Telecommunications Division.....	14,335,309	13
Meteorological Division—		
Administration, Operation and Maintenance.....	7,326,208	95
Construction or Acquisition of Buildings, Works, Land and New Equipment....	1,057,685	93
Total—Meteorological Division.....	8,383,894	88
TOTAL—AIR SERVICES.....	57,287,050	72
CANAL SERVICES—		
Administration.....	125,230	42
Operation and Maintenance.....	5,860,412	74
Construction or Acquisition of Buildings, Works, Land and New Equipment.....	2,195,534	55
Exchequer Court Award.....	130,547	05
TOTAL—CANAL SERVICES.....	8,311,724	76
MARINE SERVICES		
Administration, including Agencies.....	645,728	31
Aids to Navigation—		
Administration, Operation and Maintenance.....	4,721,793	63
Construction or Acquisition of Buildings, Works, Land and New Equipment	1,269,025	02
Total—Aids To Navigation.....	5,990,818	65

STATEMENT OF EXPENDITURES, BY APPROPRIATIONS—Continued
FISCAL YEAR 1955-56

	\$	cts.
MARINE SERVICES—Concluded		
Nautical Services Division—		
Nautical Services—		
Administration, Operation and Maintenance.....	455,504	89
Pilotage Service—		
Administration, Operation and Maintenance.....	613,599	18
Construction or Acquisition of Buildings, Works, Land and New Equipment.....	28,032	78
Pensions to Former Pilots.....	1,800	00
Total—Pilotage Service.....	643,431	91
Total—Nautical Services Division.....	1,098,936	80
Steamship Inspection—		
Administration, Operation and Maintenance.....	676,077	02
Construction or Acquisition of Buildings, Works, Land and New Equipment....	27,939	57
Total—Steamship Inspection.....	704,016	59
Marine Service Steamers—		
Administration, Operation and Maintenance.....	6,768,317	85
Construction or Acquisition of Vessels and Equipment.....	1,454,123	12
Total—Marine Service Steamers.....	8,222,440	97
Marine Reporting Service.....	117,820	97
River St. Lawrence Ship Channel Service—		
Administration, Operation and Maintenance.....	747,645	48
Contract Dredging.....	3,037,937	08
Total—River St. Lawrence Ship Channel Service.....	3,785,582	56
TOTAL—MARINE SERVICES.....	20,565,344	85
RAILWAY AND STEAMSHIP SERVICES		
Canadian Government Railways—		
Enlargement of Dock and Terminal Facilities at North Sydney, N.S.....	36,275	55
Construction of New Dock and Terminal Facilities at Port aux Basques, Nfld..	352,481	10
Construction or Acquisition of Auto-Ferry Vessels.....	2,102,830	28
Construction or Acquisition of Vessels for Newfoundland Coastal Services.....	1,044,987	53
Degaussing and Strengthening of Sea-going Merchant Ships of Canadian Registry of 1000 Gross Tons and over.....	191,543	35
Subsidy to Canadian National Railways re cost of constructing a Railway Line in Northern Quebec between St. Felicien, Chibougamau and Beattyville.....	1,250,000	00
Canadian National (West Indies) Steamships—Deficit.....	95,964	67
Hudson Bay Railway—		
Operating Deficit.....	208,084	14
Construction or Acquisition of Buildings, Works, Land and New Equipment....	190,306	17
	11,172	85
Railway Employees' Provident Fund.....		
Maritime Freight Rates Act—20% Reduction in Tolls—		
Canadian National Railways—Eastern Lines.....	9,455,342	00
Other Railways—Eastern Lines.....	1,527,648	06
	55,974	68
Official Railway Cars—Repairs and Expenses.....	1,624,639	00
P.E.I. Car Ferry and Terminals—Operating Deficit.....		
North Sydney, N.S.—Port aux Basques, Nfld. Ferry and Terminals—Operating Deficit.....	2,350,000	00
	2,918,979	23
Strait of Canso—Transportation Improvements and Facilities.....	17,500	00
Towards the cost of surveys of Newfoundland Railway Properties.....		
Supplemental Pension Allowances to Former Employees of Newfoundland Railways, Steamship and Telecommunications Services transferred to Canadian National Railways.....	29,302	34
Reconditioning and Refit of Ferry Vessel <i>Scotia II</i> for the Prince Edward Island Car Ferry Service.....	90	64
TOTAL—RAILWAY AND STEAMSHIP SERVICES.....	23,463,121	59

DEPARTMENT OF TRANSPORT

STATEMENT OF EXPENDITURES, BY APPROPRIATIONS—Continued
FISCAL YEAR 1955-56

	\$	cts.
MISCELLANEOUS		
Air Transport Board—		
Salaries and Other expenses.....	247,552	37
Board of Transport Commissioners—		
Salaries of Commissioners.....	69,680	61
Administration, Operation and Maintenance.....	897,235	45
Railway Grade Crossing Fund.....	5,000,000	00
Payments to C.P.R. and C.N.R. re maintenance of Trackage.....	6,999,999	94
Total—Board of Transport Commissioners.....	12,966,916	00
Inquiry into Agreed Charges re: Freight Rates.....	885	80
Royal Commission on Coasting Trade of Canada.....	124,424	18
Reimbursement of Dept. of Transport Stores Account for the value of stores which have become obsolete, unserviceable, lost or destroyed.....	13,812	67
Payment to The St. Lawrence Seaway Authority of an amount equal to the Net Proceeds realized from the sale of property under the Administration or Control of the Authority and paid into the Consolidated Revenue Fund during the current fiscal year.....	72,474	30
TOTAL—MISCELLANEOUS.....	13,426,065	32
GRAND TOTAL.....	124,724,511	83

STATEMENT OF REVENUES AND RECEIPTS
FISCAL YEAR 1955-56

DEPARTMENTAL ADMINISTRATION—

Sundries.....	4,709	80
Refunds of Previous Years' Expenditure—Ordinary.....	121	47
The St. Lawrence River Joint Board of Engineers—Canadian Section		
Refunds of Previous Years' Expenditure—Ordinary.....	58	49
TOTAL—DEPARTMENTAL ADMINISTRATION.....	4,889	76

AIR SERVICES—

Air Services Administration—

Sundries.....		
Refunds of Previous Years' Expenditure—Ordinary.....		99
Total—Air Services Administration.....		99

Civil Aviation Division—

Control of Civil Aviation—

Certificates and Licences.....	27,145	53
Fines, Aeronautics Act.....	4,668	25
Sundries.....	38	73
Refunds of Previous Years' Expenditure—Ordinary.....	1,128	68
Total—Control of Civil Aviation.....	32,981	19

Airways and Airports—Civil Aviation—

Aircraft Landing Fees.....	2,841,370	59
Aircraft Parking—Outside.....	57,162	13
Rentals.....	1,440,902	01
Concessions.....	944,949	48
Hotels, Dining Halls, Bars, Heating, Electrical Power Sales, Recoverable Services, etc. Gander, Nfld.....	692,988	39
Observation Roof Turnstiles—Malton Airport.....	25,243	00
Power Service.....	83,397	97
Telephone Service.....	18,291	02
Sundry Services.....	72,269	08
Mess Receipts.....	27,880	48
Sundries.....	62,622	00
Refunds of Previous Years' Expenditure—Ordinary.....	43,611	53
Refunds of Previous Years' Expenditure—Capital.....	1,381	46
Total—Airways and Airports—Civil Aviation.....	6,312,069	14

STATEMENT OF REVENUES AND RECEIPTS—Continued
FISCAL YEAR 1955-56

	\$	cts.
AIR SERVICES—Concluded		
Airway and Airport Traffic Control—		
Sundry Services.....		15
Refunds of Previous Years' Expenditure—Ordinary.....	288	66
Total—Airway and Airport Traffic Control.....	288	81
Total—Civil Aviation Division.....	6,345,339	14
Telecommunications Division—		
Radio Aviation Services—		
Rentals.....	157,144	15
Power Service.....	11,685	00
Air-Ground Radio Service.....	374,572	31
Radio Message Tolls.....	55,437	37
Mess Receipts.....	2,729	61
Sundries.....	843	78
Refunds of Previous Years' Expenditure—Ordinary.....	6,667	48
Refunds of Previous Years' Expenditure—Capital.....	1,670	62
Total—Radio Aviation Services.....	610,750	32
Radio Act and Regulations—		
Radio Operators' Examination Fees.....	1,703	00
Radio Licence Fees.....	205,487	60
Fines—Radio Act Regulations.....	196	36
Rentals.....	4,944	79
Sundries.....	4,095	78
Refunds of Previous Years' Expenditure—Ordinary.....	1,207	98
Refunds of Previous Years' Expenditure—Capital.....	464	20
Total—Radio Act and Regulations.....	218,099	71
Radio Aids to Marine Navigation—		
Commercial Message Tolls.....	211,879	28
Rentals.....	24,843	89
Mess Receipts.....	3,898	81
Sundries.....	84	40
Refunds of Previous Years' Expenditure—Ordinary.....	4,383	75
Total—Radio Aids to Marine Navigation.....	245,090	13
Telegraph and Telephone Service—		
Telegraph and Telephone Tolls.....	203,439	08
Rentals.....	714	00
Sundries.....	742	73
Sale of Mount Hayes—Sandspit System.....	35,000	00
Refunds of Previous Years' Expenditure—Ordinary.....	1,547	66
Total—Telegraph and Telephone Service.....	241,443	47
Northwest Communication System—		
Profit from operations.....	592,201	45
Sundries.....	5,037	97
Refunds of Previous Years' Expenditure—Ordinary.....	29,104	53
Total—Northwest Communication System.....	626,393	95
Total—Telecommunications Division.....	1,941,777	58
Meteorological Division—		
Radio Commercial Message Tolls.....	3,041	82
Rentals.....	30,675	64
Sundries.....	17,176	74
Refunds of Previous Years' Expenditure—Ordinary.....	7,594	67
Refunds of Previous Years' Expenditure—Capital.....	283	93
Total—Meteorological Division.....	58,772	80
TOTAL—AIR SERVICES.....	8,345,890	51

DEPARTMENT OF TRANSPORT

STATEMENT OF REVENUES AND RECEIPTS—Continued
FISCAL YEAR 1955-56

	\$	cts.
CANAL SERVICES—		
Rentals.....	963,102	51
Wharfage.....	348,242	57
Power Service.....	19,451	92
Linesmen's Fees.....	251,427	50
Sundries.....	153,608	48
Refunds of Previous Years' Expenditure—Ordinary.....	27,044	40
Refunds of Previous Years' Expenditure—Capital.....	400,734	61
TOTAL—CANAL SERVICES.....	2,163,611	99
MARINE SERVICES—		
Aids to Navigation—		
Wharf Rental and Wharfage—Harbours and Piers Act.....	432,487	16
Harbour Dues.....	147,843	22
Rentals.....	24,256	95
Sale of Land and Buildings.....	1,312	00
Sundries.....	7,220	83
Refunds of Previous Years' Expenditure—Ordinary.....	76,610	24
Total—Aids to Navigation.....	689,730	40
Nautical Services Division—		
Nautical Services.....		
Fines and Forfeitures—Canada Shipping Act.....	5,512	78
Measuring Surveyors' Fees.....	396	50
Examination of Masters and Mates.....	6,806	40
Inspection of Registry Books.....	9,552	01
Certificates.....	1,599	19
Shipping Fees.....	4,142	36
Sundries.....	5,993	64
Refunds of Previous Years' Expenditure—Ordinary.....	7	80
Total—Nautical Services.....	34,010	68
Pilotage Service—		
Pilots Licence Fees.....	251	00
Pilotage Fees.....	12,859	27
Sundries.....	810	50
Refunds of Previous Years' Expenditure—Ordinary.....	98	70
Total—Pilotage Service.....	14,019	47
Total—Nautical Services Division.....	48,030	15
Steamship Inspection—		
Annual Fees.....	115,914	71
Incidental Fees.....	32,059	75
Engineers' Examination Fees.....	3,939	25
Plans.....	2,533	05
Sundries.....	6,473	23
Refunds of Previous Years' Expenditure—Ordinary.....	582	15
Total—Steamship Inspection.....	161,502	14
Marine Service Steamers—		
Marine Service Steamers' Earnings.....	20,335	21
Sundries.....	1,162	70
Refunds of Previous Years' Expenditure—Ordinary.....	4,296	44
Refunds of Previous Years' Expenditure—Capital.....	1,715	28
Total—Marine Service Steamers.....	27,509	63
Marine Reporting Service—		
Signal Station Dues.....	1,513	00
River St. Lawrence Ship Channel Service—		
Sundries.....	320	00
TOTAL—MARINE SERVICES.....	928,605	32

STATEMENT OF REVENUES AND RECEIPTS—Concluded
FISCAL YEAR 1955-56

	\$	cts.
RAILWAY AND STEAMSHIP SERVICES—		
Recovery under certain Railways' Subsidy Acts Agreements.....	174,025	60
Sundries.....		7 00
Refunds of Previous Years' Expenditure—Ordinary.....	10,456	49
TOTAL—RAILWAY AND STEAMSHIP SERVICES.....	184,489	09
MISCELLANEOUS SERVICES—		
Air Transport Board—		
Sundries.....		4 00
Refunds of Previous Years' Expenditure—Ordinary.....		5 09
Total—Air Transport Board.....	9	09
Board of Transport Commissioners—		
Licences to ships.....	1,895	58
Sales of Publications.....	726	25
Refunds of Previous Years' Expenditure—Ordinary.....		8 75
Total—Board of Transport Commissioners.....	2,630	58
Department of Transport Stores Account—		
Inventory overages.....		395 50
Park Steamship Co. Ltd.—		
Surplus in excess of requirements.....	25,000	00
TOTAL—MISCELLANEOUS SERVICES.....	28,035	17
GRAND TOTAL.....	11,655,521	84

EXPENDITURES MADE BY DEPARTMENT OF TRANSPORT FROM FUNDS
PROVIDED BY OTHER DEPARTMENTS, OR AGENCIES
FISCAL YEAR 1955-56

	\$	cts.
Department of Citizenship and Immigration.....		550 98
Department of Fisheries.....	11,974	54
Department of Mines and Technical Surveys.....	10,736	37
Department of National Defence.....	11,469,465	53
Department of National Health and Welfare.....	12,785	00
Department of National Revenue.....	88,328	43
Department of Northern Affairs and National Resources.....	10,642	95
Department of Public Works.....		335 15
Post Office Department.....	8,010	69
Royal Canadian Mounted Police.....	59,203	01
Total.....	11,672,032	65

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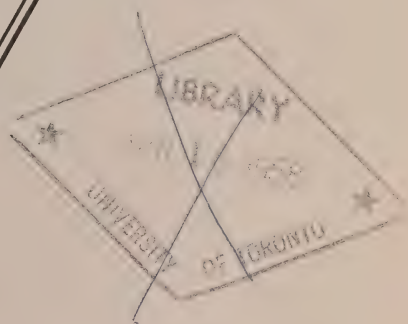


CANADA

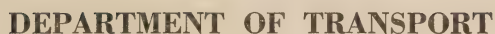
Government
Publications

ANNUAL REPORT
the Fiscal Year Ended
March 31, 1957

DEPARTMENT OF TRANSPORT
1956-1957



**Submitted under the provisions
of the Department of Transport
Act**



FOR THE FISCAL YEAR ENDED

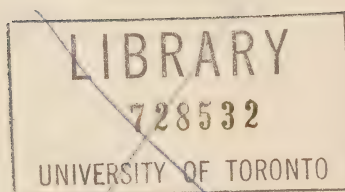
MARCH 31

1957

Submitted under the provisions of the
DEPARTMENT OF TRANSPORT ACT

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*To His Excellency the Right Honourable Vincent Massey, C.H., P.C.,
Governor General and Commander-in-Chief of Canada.*

MAY IT PLEASE YOUR EXCELLENCY:

The undersigned has the honour to present to Your Excellency the Annual Report of the Department of Transport, for the fiscal year ended March 31, 1931.

GEORGE HEES,
Minister of Transport.

MINISTRY OF TRANSPORT

MINISTER

BOARDS, COMMISSIONS AND GOVERNMENT-OWNED COMPANIES

Air Transport Board
Board of Transport Commissioners
Canadian Maritime Commission
Canadian National Railways
Canadian National (West Indies) S.S. Co.
Canadian Government Merchant Marine, Ltd.
Canadian Overseas Telecommunication Corporation
National Harbours Board
St. Lawrence Seaway Authority
Steamship Inspection Board

ACTS ADMINISTERED BY THE DEPARTMENT OF TRANSPORT

GENERAL

Bills of Lading Act
Canadian Overseas Telecommunication Corporation Act
Department of Transport Act
Pipelines Act
St. Lawrence Seaway Authority Act
Telegraphs Act
Transport Act

Navigable Waters' Protection Act
New Westminster Harbour Commissioners Act
North Fraser Harbour Commissioners Act
Port Alberni Harbour Commissioners Act
Toronto Harbour Commissioners Act
Water Carriage of Goods Act
Winnipeg and St. Boniface Harbour Commissioners Act

AIR SERVICES

Aeronautics Act
Carriage of Goods by Air
Radio Act

RAILWAYS

Canadian National Railways Act
Canadian National-Canadian Pacific Act
Canadian National Railways Pensions Act
Government Railways Act
Intercolonial Railway and P.E.I. Railway Employees Provident Fund Act
Maintenance of Railway Operations Act
Maritime Freight Rates Act
Railway Act

MARINE

Belleville Harbour Commissioners Act
Canada Shipping Act
Canadian Maritime Commission Act
Canadian National Steamships Act
Government Harbours and Piers Act
Government Vessels Discipline Act
Hamilton Harbour Commissioners Act
Live Stock Shipping Act
National Harbours Board Act

AIR SERVICES

General

Canadian aviation showed a marked growth during the past year. To accommodate the newer types of larger and faster aircraft, it has been necessary to build new runways, and lengthen and strengthen old ones. Increased demand for air services has resulted in the construction of new airports and terminal buildings.

Additional telecommunication and meteorological services have been introduced to meet the needs of DEW and Mid-Canada defence lines, and the increasing development of Northern Canada in its many aspects.

Air Traffic Control

Surveillance radar equipment to ensure more effective air traffic control has been ordered for fifteen major airports. This equipment will enable traffic controllers to see small fighter type aircraft up to 100 miles and transport type up to 150 miles at elevations of up to 60,000 feet. In addition, four smaller radars have been purchased for training and short range work. Installation of two of the latter was completed at Montreal and Winnipeg airports.

New control towers were commissioned at Saint John, N.B., Val d'Or, P.Q., and Port Hardy, B.C., and a new area control centre was established at Goose Bay, Labrador, making a total of 26 control towers and eight control centres operated by the Department. Landings and take-offs at controlled airports totalled 2,225,384, an increase of 17.07% over the preceding year, 77.4% of which were civil operations and 22.6% were military.

Plans have been prepared covering the development of specific routes to northern parts of Canada, in keeping with the continued northward expansion of aviation.

Training

The establishment of training schools at Toronto and Winnipeg for air traffic controllers and the subsidized courses by radio schools for the training of radio operators have met with marked success in overcoming the critical shortage of qualified staff. Graduates from the Air Traffic Training School at Toronto numbered 85, and from Winnipeg, 83. Additional classes were established at each of the eight area control centres to provide advanced training for selected personnel.

Under the Department's scheme of financial assistance for private pilot training, 1,808 students received instruction. Approved courses were conducted by 38 flying clubs and 43 commercial flying schools.

Instructor refresher courses, managed jointly by the Royal Canadian Flying Clubs Association and the Air Industries and Transport Association, were sponsored by the Department; 59 instructors were graduated.

Accident Investigations

There were 262 accidents involving Canadian registered civil aircraft, excluding minor accidents. The number of accidents attributed to personnel error was 74.8%, an increase of 22.5% over the previous year. There was a decrease of 4.8% in material failures and 6.1% in accidents due to weather. Undetermined causes increased by 3.7%.

Airport Revenues

Airport revenues totalled \$6,701,500, an increase of \$435,500 over the previous year.

Air carriers operating in Canada numbered 375, of which 225 were Canadian and 150 were foreign and Commonwealth operators.

Airport Development

New runways were completed or existing runways strengthened and lengthened at 11 airports and similar development commenced at 15 others, including the construction of new airports at Halifax, Williams Lake, B.C., and Aklavik, N.W.T. New airport sites were surveyed at Edmonton, Riviere du Loup and Sherbrooke.

Terminal buildings were completed at Stephenville, Nfld., Seven Islands, P.Q., and Comox, B.C., largely completed at Quebec, P.Q., and Windsor and extended at Vancouver. Work began on a terminal building at St. John's, Nfld. and progress was made on new terminals at Gander, Montreal and Ottawa. Dwellings, buildings for instrument landing systems, power plants, radio and meteorology were commenced or completed at 38 sites.

The power distribution system for the second stage of the Gander, Nfld. townsite development was completed and work started on another 200 housing units.

Radio and T.V.

The number of radio stations increased by approximately 5,000, bringing the total to about 48,000, which includes radio stations operated by federal, provincial and municipal governments, stations on ships and aircraft, mobile stations, DEV and Mid-Canada Line projects, etc.

Rapid expansion in common carrier radio services continued throughout the year. The use of radiotelephone on small vessels again showed a marked increase.

The licensing of low-power television rebroadcasting stations using "off-the-air" pickup was introduced. Seven private commercial broadcasting stations (television) began operation and eight new ones were authorized.

A site was selected at Port Arthur, Ont., for the ninth of monitoring stations operated by the Department across the country, and sites were chosen for the relocation of two.

Spectrum Conservation

A strict program of spectrum conservation is necessary if this country's growing radio communications requirements are to be met. The Department is working in close co-operation with the Canadian Radio Technical Planning Board (a

organization which represents the users and manufacturers of radio in Canada) to improve the technical suitability of radio equipment. The Department operates a Standards Laboratory where type approval performance tests are carried out.

Because of serious congestion on the medium frequencies used in the maritime mobile service, the adoption of improved equipment over a five-year period is being promoted and the use of very high frequencies (VHF) for short range communication is being encouraged. Steps have also been taken to promote more efficient operating practices.

Radio Aids to Navigation

The Omni-Range airway program was further advanced in the selection of sites, procurement of equipment and related construction of buildings.

Additional radio aids to marine and air navigation were installed in various parts of the country. Mont Joli was commissioned as an international air-ground communications station, and another one was established at Resolute, N.W.T., to provide service to polar flights between Europe and the West Coast of North America.

Cardinal, Ont., was selected for a radiotelephone station to improve the service to shipping between Montreal and Kingston and plans were made for a combined aviation and marine radio station at Wiarton to replace the facilities at Midland.

The Department is co-operating in evaluation trials of a new type of long-distance aid to navigation known as Dectra. Two experimental stations established near Gander, together with similar stations in the U.K., are expected to provide parallel tracks and distance information to aircraft flying the North Atlantic.

The Department took over the operation of all the stations on the East Coast, St. Lawrence and Great Lakes formerly operated for the Department by the Canadian Marconi Company.

Interference Suppression

The Department's sixty cars, equipped for the investigation of interference, located 11,355 sources and suppression was obtained in all but a few cases. Power lines were the largest single source, constituting 37% of the total.

Examinations and Inspections

During the year 3,244 examinations for proficiency in radio were conducted from which 2,861 new certificates resulted.

More than 9,800 radio stations of all classes were inspected, including 162 surveys of Canadian and foreign ships.

Trans-Atlantic Cable

The first trans-Atlantic telephone cable system jointly owned and operated by the British General Post Office, the American Telephone and Telegraph Company and the Canadian Overseas Telecommunication Corporation was opened to public service on Sept. 25, 1956. C.O.T.C. and the U.K. Post Office have under study the possible commissioning in 1961 of a second cable to be jointly owned and financed by Canada and the U.K.

Telecommunications Revenues

Revenue from all sources, including messages handled through marine radio and aeronautical stations, and the Government telegraph and telephone service, totalled \$1,882,339, and \$416,750 was collected for the C.B.C. from licences issued for private commercial broadcasting stations.

Government Telegraph and Telephone Service

Reduction of the Government telegraph and telephone service in various parts of the country included the sale of all lines on Grand Manan Islands, including the radio link with the main land, to the New Brunswick Telephone Company; the sale of lines in the St. Marguerite, Albertville, and St. Alexis de Matapedia areas, P.Q., to the Quebec Telephone Company; sale of facilities on Amherst Island near Kingston, Ont., to the local Municipal telephone authority; the closing out of telegraph lines and operations in Saskatchewan, Alberta, and British Columbia, with the exception of the telegraph line from Peace River to Fort Vermilion; the disposal of the communication system between The Pas and Churchill to the Canadian National Telegraphs.

The telephone system on the Magdalen Islands, P.Q. was expanded.

Northwest Communication System

Northwest Communication System radio facilities were increased generally to serve exploration, survey, pipeline and railway crews, and others in isolated areas, including the establishment of a radio program network and facsimile transmitting facilities between Edmonton-Fort Nelson-Whitehorse. An additional 9,700 miles of telephone and 7,300 miles of telephone carrier channels were provided to meet new needs, particularly in the Dawson Creek-Fort St. John area where facilities were increased over 400%.

Over 2,400 wire miles between Whitehorse and the Yukon-Alaska border were completed well ahead of schedule.

The total cost of operating the Northwest System was \$1,714,675.56 and the revenue earned amounted to \$2,501,122.01.

Meteorological Services

Increased activity in the North as well as the growing volume of air traffic have generally stepped up the demands for meteorological services.

As most of the professional staff are employed as forecasters, the current severe shortage of such staff resulted in serious operating difficulties, but major commitments were carried out. Forecasts were issued four times daily for inland regions and 20 cities. Daily forecasts for coastal waters and inland lakes were issued for 36 marine areas, and supplementary special forecasts were supplied for agricultural, forestry, industrial and other interests.

Forecasts were supplied to the press, radio and T.V.

Weather studies now included in most school curricula have resulted in increased requests for educational publications. Staff members are continually being called upon to address service clubs, schools and other organizations.

Weather training was given to DEW Line operators, and plans developed for weather stations along the Mid-Canada Line.

"Met" Communications

Plans have been made to double the speed in providing basic weather maps for the Department of National Defence.

The meteorological teletype system reached a record total of 33,300 miles of circuit, and the Canadian weatherfax system, 12,700 airline miles. A major step forward was taken with the establishment of a full duplex trans-Atlantic teletype circuit between the British and Canadian Meteorological Services for the exchange of European and North American weather reports.

Special Studies

Special studies were made of 5-day and 30-day forecasts—services not yet provided by the Meteorological Branch.

The investigation of the Arctic-stratospheric jet stream was particularly productive. For the first time the existence, structure, and behavior of this jet stream were demonstrated from actual wind data, yielding knowledge which will be of increasing practical importance when aircraft begin to operate in the 60,-100,000 foot range.

The Department is co-operating in a study of hail formation which is a serious hazard of Alberta farmers. It is also actively involved in research dealing with the International Geophysical Year, with special emphasis on studies of ozone, radiation and turbulence at Alert and Resolute, N.W.T., and Moosonee, Ont.

Major climatological studies were undertaken for the Department of National Defence and other government departments.

Instrument Production

The Instrument Workshop's production rose in line with increased requirements, a major responsibility being the design of equipment for use during the IGY.

Development work on the new Canadian radiosonde was completed and production began.

CANAL SERVICES

Navigation

Canada's canals are concentrated in the St. Lawrence River Basin, the most important being those which comprise the Main Route along the St. Lawrence River and through the Great Lakes. These canals make navigation possible for a distance of 1,875 miles from the Atlantic seaboard to the western end of Lake Superior. The great commercial value of this waterway is reflected in the tremendous growth of the many industrial areas which are established on both sides of the International border. Twenty-four-hour-a-day navigation is provided throughout the Main Line Canals from early in April until mid-December.

In order to facilitate passage of vessels through the lower canals from freeze-up till the close of navigation, considerable experimental work was carried out on the Lachine and Soulanges Canals using various methods of combatting ice formation. Special low temperature greases were used on all exposed machinery and compressed air was used to clear the floating ice from the lockgate recesses. This proved highly successful, but an attempt to keep the surface ice in one lock melted by chemical means did not prove effective. Further research and experimental work on combatting ice is being carried out.

Traffic Increase

The freight tonnage passing through the various main line canals has shown a marked increase in recent years—the 1956 traffic was the heaviest on record. On the Welland Ship Canal, the amount of freight carried has increased by 118% in the last ten years and the number of vessel passages has increased by 70% in the same period. The eight Secondary Canals have also shown considerable increase in traffic. The following figures are indicative of the increased freight traffic, of which 91% of the total was transported by vessels of Canadian registry:

Canal	Freight (Tons)		Increase Per cent
	1956	1955	
Sault Ste. Marie	2,991,736	2,202,638	35.8
Welland Ship	23,066,261	20,893,572	10.4
Cornwall	12,872,466	10,862,194	18.51

(A comprehensive report prepared by the Public Finance and Transportation Division of the Dominion Bureau of Statistics in collaboration with Canal Services, giving a detailed analysis of freight and vessel movements throughout the various canal systems, is obtainable from the Dominion Bureau of Statistics, Department of Trade and Commerce, Ottawa.)

Foreign Vessels

The number of foreign vessels engaged in the lake trade increased to 125 from 119 the previous year, and the number of trips during the season amounted to 334 as compared with 329 in 1955.

Hydraulics

As in previous years, the flow of water through the canals was regulated by means of the network of dams and weirs to prevent flooding and maintain water supplies in natural reservoirs to be distributed throughout the year to the best advantage for navigation, power generation, municipal supply and other interests concerned. A considerable quantity of water is leased to Ontario Hydro and the other private power companies for power development. On the Welland Ship Canal, for instance, some 6,400 c.f.s. of water is leased for the Ontario Hydro DeCew Falls plant, representing an annual revenue to the Department of approximately \$350,000.

Daily computations were made of the flow of water into each canal and its distribution throughout the waterway.

Construction and Engineering

The twenty million dollar Canso Causeway Project was brought to virtual completion in March of 1957 with final work on the Canso Canal which can accommodate vessels up to 715 feet long and 28-foot draft.

New swing bridges were built under contract at Kingston Mills on the Rideau Canal and at Warsaw Road, Peterborough, on the Trent Canal. Construction of a new 1,000 KVA electrical substation to provide power to the stores and shop area of the Welland Ship Canal was commenced and the rebuilding of the northeast entrance pier of the Sault Ste. Marie Canal was completed. Test borings were taken for the piers of the projected bascule bridge over the Lachine Canal at Ville St. Pierre.

Maintenance

Besides the usual items of maintenance, a major program of replacing vertical lift bridge counterweight cables was commenced on the Welland Ship Canal with the renewal of the 48 steel ropes on the east end of railway bridge No. 10. Also extensive concrete repairs were made to the filling culvert of Lock 5 of the Welland Ship Canal.

St. Lawrence Seaway and Power Project

Close co-operation is maintained with the St. Lawrence Seaway Authority and Ontario Hydro to facilitate construction work.

A diversion canal and tunnel were completed on the Cornwall Canal to provide navigation around the Hydro power plant. Three passing places were dredged in the Galops Canal to provide two-way navigation and permit closing of the river for construction of the Seaway Lock and Hydro control dam at Iroquois. As a result, a marine radiophone system was installed at the Iroquois Lock 25 to provide necessary vessel control in this canal. Work proceeded on the multi-million dollar Seaway Authority dredging program on the Welland Ship Canal. Navigation regulations and canal operations were adjusted as required to facilitate work of the various contractors, and canal equipment and services were made available when required.

MARINE SERVICES

Three Lightships Replaced

Of major interest during the year was the retirement of three lightships. The 50-year-old Sambro Lightship, stationed off Halifax Harbour, was replaced by a new diesel-powered lightship of modern design carrying a full range of navigation aids. The new White Island pier lighthouse and fog-alarm station, situated five miles off shore in the St. Lawrence River below Quebec, was placed in operation. It released Lightship No. 20 which was transferred to nearby Prince Shoal replacing Lightship No. 7 withdrawn from service. The Sand Heads lightstation marking the north entrance to the Fraser River, B.C., was completed and placed in service. This modern station, mounted on a pier structure of steel piles encased in concrete, replaced Lightship No. 16.

New Marine Agency

A new District Marine Agency, the eleventh in Canada, was established with headquarters at Fort Smith, N.W.T., to administer an expanded program of navigational aids in the Mackenzie River-Great Slave Lake area extending from northern Alberta to the western Arctic. In recent years a heavy volume of shipping has developed in these northern waters and, in addition to a large increase in the number of buoys, the program includes plans for improved shore markers and new lights. Four work parties were engaged in different sections of the water routes and considerable progress was made in this first season of extended operations.

Construction and Installations

Piling for the foundation of a new pilotage building in Montreal was completed in the spring and construction of the building is proceeding. Plans were drawn up for a new office and stores building for the Halifax Marine Agency and are in preparation for new facilities for the Marine Agency at Saint John N.B. In Quebec City, progress was made in the reconstruction of Queen's Wharf at the Marine Agency there.

On the East Coast, new fog-alarm stations were established at Glace Bay and Pease Island, and Sydney Bar station was relocated, rebuilt and provided with the latest type of electrically-operated fog signal, controlled from shore by submarine cables. On the West Coast, a new power fog alarm was established at Chatham Point, B.C.

Modern diesel equipment has proven both reliable and economical at fog-alarm installations, and a number of new units were taken into service during the year. As new station equipment is required, it is expected that diesel engines will replace the older kerosene engines. In keeping with its policy of providing improved living conditions for lightkeepers and their families, the Department has equipped many isolated lightstations throughout the country with diesel generator

sets. In addition to supplying power for navigation aids, these units can operate modern conveniences such as deep freezers, refrigerators, electric lights and water systems.

The program for supplying Agency depots with mobile hoists or cranes was continued, with two more units being provided. These new facilities have resulted in speeding up the handling of buoys to and from the ships and also buoy cleaning and painting operations.

Arrangements are well advanced for the installation of lights and other navigational aids required for the St. Lawrence Seaway.

Research Development

Experimental work is proceeding on a single station range light, and an electric emitter fog signal is also undergoing tests for possible modification for use at locations where hydro power is available. It has many advantages over compressed-air equipment.

Successful tests were carried out on a new solar-battery sun-switch and flasher developed in conjunction with the National Research Council. Designed to extinguish battery-operated lights during daylight hours, this apparatus represents a marked advance and is expected to result in substantial battery savings, along with other advantages. Plans are being made for the large-scale manufacture and assembly of these units.

Marine Revenues

Public harbour dues collected during the year totalled \$157,302, a decrease of \$20,753 over the previous year.

Rental from water lots, leased for various purposes, totalled \$30,775 compared with \$19,163 the previous year. Wharfage collections amounted to \$684,108, an increase of \$62,300 over the preceding year.

Registry of Ships

The maximum tonnage for registry exemption was raised from ten to fifteen tons, bringing the Canadian exemption in line with the U.K. and other parts of the Commonwealth. Vessels added to Canadian registry totalled 979, with 521 removed, making a net gain of 458. At the end of 1956 there were 17,653 vessels, totalling 2,347,311 gross tons, registered in Canada.

Licensing of Small Vessels

Under the Small Vessel Licensing Regulations, 37,469 small vessels, exempt from registry, received licences during 1956.

Air-Sea Rescue

An agreement was entered into with the B.C. Towboat Owners' Association whereby the Association provides a Marine Adviser to co-ordinate air-sea rescue facilities with the services of tow boats operating on the British Columbia coast. The Department of Transport is contributing \$10,000 yearly to help cover salaries and office maintenance expenses.

Pilotage

There were 337 licensed pilots in the nine districts for which the Minister of Transport is the pilotage authority. They performed 32,581 pilotages inward or outward and 10,246 movages. A gross amount of \$3,573,039.09 was earned in pilotage fees.

Examinations

Examinations numbering 786 were held for Masters, First Mates and Second Mates Certificates of Competency and Service. A total of 312 Masters, 118 First Mates, and 96 Second Mates were issued with certificates; 190 renewals of Temporary Masters Certificates were issued for which no examinations were held.

Navigation Schools

At Quebec and Prince Rupert, navigation schools were fully maintained by the Department in the winter months. The school at Prince Rupert gives instruction chiefly for the benefit of operators of small vessels. Financial aid was given to navigation schools under local education authorities at Halifax, Saint John, N.B., Montreal and Vancouver.

Marine Casualties

Nine preliminary inquiries and two formal investigations into marine casualties were held. The formal investigations were into the loss of the M.V. *Triggerfish* with three lives off Atkinson Point, B.C., on Oct. 5, 1956, and the *Pilot Boat No. 1*, with seven lives, off Saint John, N.B., on Jan. 14, 1957.

Fleet of 80 Units

The Department's fleet, consisting of approximately 80 units, comprises lighthouse supply and buoy vessels, icebreakers, lightships, weatherships, miscellaneous tugs, lightering equipment and barges. Repair contracts completed on about half of these vessels, including major repairs to the C.G.S. *Edward Cornwallis*, *N. B. McLean*, *C. D. Howe* and *Saurel*, totalled \$1,304,676.

New Vessels

New construction completed and delivered included the *Sir James Douglas*, a new lighthouse supply and buoy vessel for service at Victoria; the icebreaker C.G.S. *Montcalm*; *Lightship No. 1* and *Pilot Boat No. 5* for Halifax. The frigate *St. Stephen* was converted for weathership service in the Pacific, and the S.S. *Scotia II* for train-ferry service between Cape Tormentine, N.B. and Borden, P.E.I. New construction on hand includes a supply and buoy vessel for service at Quebec; a workboat for Port Arthur; the Caribou-Wood Island ferry; an icebreaker, supply and buoy vessel for the Maritimes and one for service in the Great Lakes. In addition to eight landing craft being added to the fleet, one was converted to a dry cargo vessel, one to a tanker, and one to a bulk oil carrier. Tenders have been called for an icebreaker for service in the St. Lawrence River and northern waters, a sounding vessel for Ship Channel service, and a buoy vessel for the Sorel Agency.

Northern Operations

The *Ernest Lapointe* was the first departmental vessel to proceed North this year, leaving for Goose Bay, Labrador, on June 20. The C.G.S. *C. D. Howe* followed on June 28, sailing from Montreal on her seventh Eastern Arctic patrol with cargo for 31 ports, the *Edward Cornwallis* on June 25, and the *N. B. McLean* on June 27. The *N. B. McLean* made 40 ports of call, returning to Quebec on Nov. 26 after completing her longest Arctic voyage to date.

Operation *Nors 56*, supplying Eastern Arctic stations, got under way with the sailing of the *d'Iberville* from Montreal on July 24 for Resolute and Eureka. The vessel formed convoy with the S.S. *Federal Voyager* and the M.V. *Green Ranger* and returned to Quebec on Sept. 9, completing another successful voyage. In addition, 12 commercial ships were chartered to carry cargo to various Northern stations. Later in the season, the *d'Iberville* made a trip to Great Whale River and Cape Jones, and the *Ernest Lapointe* made another cargo trip to Goose Bay. In all, more than 27,800 tons of cargo were carried during the 1956 season of Northern operations.

Aerial Surveys

The annual spring aerial investigation of ice conditions in the St. Lawrence and on the east coast was carried out by the Department and the International Ice Patrol. The Department sponsored the first aerial ice survey in the Strait of Belle Isle and the second for Hudson Bay and Strait.

St. Lawrence Ship Channel

The C.G.S. *Ernest Lapointe* was loaned to the Quebec Agency as a replacement for the C.G.S. *Lady Grey* and the C.G.S. *Berthier*, *Frontenac* and *Detector* operated at full capacity.

The widening at St. Antoine and St. Augustin was completed. Work began on a four-year dredging program between Montreal and Quebec, a second step in widening to a minimum of 800 feet the existing 550-foot channel.

Because the eventual improvement of both the channel to Chicoutimi and the harbour itself may become pressing with the construction of the rail link to Chibougamau and the opening of the Seaway to larger lake vessels, a general exploration of a widening and deepening project was undertaken. The entire nine miles of channel and the area to be widened were tested and possible terminal sites were assessed. Considerable dredging was carried out for the National Harbours Board account.

Icebreaking

Moderate weather held until December and icebreakers had no difficulty conveying late sailings. All ships got clear of the St. Lawrence without mishap with the exception of one small freighter which had to winter at Rimouski.

The *d'Iberville*, *Ernest Lapointe*, and *N. B. McLean* were kept busy at a variety of tasks during a difficult winter in the St. Lawrence. The last ice barrier to Montreal Harbour was broken on March 15. The C.G.S. *Montcalm*, latest addition to the icebreaking fleet, gave valuable assistance from March 18 onward,

replacing the *N. B. McLean* at Quebec. The latter ship, on March 21, was thus able to leave for the Gulf where she assisted early arrivals and rescued icebound sealers. The *d'Iberville*, sailing the same day, succeeded in opening the Saguenay for navigation by April 4. Following this, she joined other icebreakers in the Gulf, where ice conditions were the worst in many years.

From February 9 to May 30 all available icebreakers were engaged for over two hundred days in coping with this Gulf situation, covering a total of 15,915 miles, while assisting 120 vessels.

On April 4 the Port of Montreal was opened to overseas shipping. On April 8 the St. Lawrence was considered safe for daylight navigation to Montreal and the Lachine Canal was opened on April 15.

STEAMSHIP INSPECTION SERVICE

Ship Inspection

Inspection was made of 1,800 steamships with an aggregate gross tonnage of 1,690,771 tons; 20 ships were inspected during conversion or reconditioning, and 36 ships were inspected at the request of the governments of other countries in accordance with the provisions of the International Convention for the Safety of Life at Sea, 1948. Of the 3,528 inspections of ships' tackle carried out, 367 cases required repair, adjustment or testing of cargo handling gear in the interest of safety.

Shipbuilding has been fairly active, 106 ships, including bulk carriers for Great Lakes service, ferries and various types of fishing vessels being constructed and completed under inspection.

Life-Saving Equipment

As a result of consultations with manufacturers of life-saving garments for small craft, an affidavit system of approval for such equipment was introduced. Manufacturers have the option of adopting the new system or continuing the former approval procedure.

The use of specially approved life-saving vests and life-saving jackets, previously limited to pleasure craft not more than 26 feet in length, has now been extended to all power-driven boats of not more than 40 feet in length that do not carry passengers. The use of specially approved life-saving cushions, however, is still limited to pleasure power boats not more than 26 feet in length. Small vessels not subject to inspection but required to carry certain life-saving and fire-extinguishing equipment will continue to be checked by the R.C.M.P.

Oil Pollution Regulations

Regulations to prevent the pollution of Canadian territorial and inland waters by oil from ships were brought into effect as a result of an intensive survey made of the problem by the Board.

Marine Engineer Training

In co-operation with the Department, marine engineering schools are conducted at St. John's, Nfld., Halifax, N.S., and Rimouski and Montreal, P.Q., by the provincial authorities concerned, and at Toronto by the Dominion Marine Association. Correspondence courses for all grades of Certificates of Competency, set by the Department in conjunction with the instructors and with the Marine Engineer Instructor of the Vancouver Vocational Institute, have been started and although not yet completed, those in operation have proved satisfactory.

To provide a source of properly trained marine engineers for departmental ships, and for other positions within the Department where a broad practical and technical knowledge of marine engineering is required, the Department has under-

taken the training of high school graduates for such positions. The ten candidates selected will serve a five-year shipyard apprenticeship during which, in addition to practical training, they attend evening classes in designated subjects to advance their technical knowledge as well as one month each year at a full-time day school. On completion of this training, each will be appointed to a departmental ship as a Junior Engineer Officer where they will receive further instruction to qualify for a Second and First Class Certificate of Competency.

RAILWAY SERVICES

Canadian National Railways

The operations of the Canadian National Railways for the calendar year 1956 produced a surplus of \$26,076,951, compared with a surplus of \$10,717,689 the previous year.

Canadian National (West Indies) Steamships Ltd.

In 1956 the operations of Canadian National (West Indies) Steamships Limited produced a surplus of \$23,281 compared with a deficit of \$95,964 in 1955. The provision of refrigeration chambers in five ships at a capital expenditure of \$71,563 completed the installation of such facilities in the Company's fleet.

Hudson Bay Railway

Hudson Bay Railway operations produced a surplus of \$34,298 before depreciation or interest on Investment compared with a deficit of \$305,654 the previous year, due mainly to a substantial increase in all types of traffic. A total of 660,920 tons of revenue freight was handled, an increase of 99,067 tons over the previous year, 78% of which consisted of wheat for export, and 46,300 passengers were carried compared with 34,498 in 1955.

Prince Edward Island Car Ferry and Terminals

The Prince Edward Island Car Ferry and Terminals operated at a deficit of \$1,804,287 compared with \$1,624,639 the previous year. Passenger and freight traffic continued to increase, with an increase of 4% in highway vehicles over the previous year.

Cabot Strait Ferry Service

In addition to the regular ferry service operating between North Sydney, N.S., and Port aux Basques, Nfld., the *William Carson* was continued in freight service operations between North Sydney and Argentia, Nfld., pending completion of harbour improvements at Port aux Basques. Extra ships were operated between North Sydney and other Newfoundland ports to relieve freight congestion moving out of North Sydney. The deficit in the operation of these services for the calendar year 1956 amounted to \$4,307,918.

Total expenditure on new terminal facilities at North Sydney and Port aux Basques amounted to \$5,460,206 at March 31, 1957.

Yarmouth, N.S.-Bar Harbor, Me. Ferry Service

This service, operated by the Canadian National Railway, is provided by the M.V. *Bluenose* and was inaugurated Jan. 4, 1956. It resulted in a deficit of \$304,349.67 for the calendar year 1956.

New Ships for Newfoundland Service

Two new ships built in the United Kingdom for service in Newfoundland were delivered in 1956—the M.V. *Bonavista* costing \$1,070,228.95 and the M.V. *Monia* costing \$1,058,169.54.

Canso Causeway

The Canso Causeway, started in 1952, was practically completed by the end of the fiscal year, with a total of \$19,955,984 being expended on the project to March 31, 1957.

Railway Subsidies

A subsidy of \$2,725,000 was paid to the Canadian National Railways towards the construction of 109 miles of the Beattyville-Chibougamau-St. Felicien branch line in the Province of Quebec, and \$500,000 was paid to the Province of British Columbia towards the extension of the Pacific Great Eastern Railway.

FINANCIAL SUMMARY

A total of approximately \$161,000,000, including about \$12,400,000 from funds provided by the Department of National Defence and other government departments, was expended during the year. The total expenditure was approximately \$25,000,000 higher than the previous year, due mainly to airport and ship construction.

Summary of Expenditures and Revenues Fiscal Year 1956-57

	Expenditures \$	Revenues \$
Departmental Administration	1,971,371.24	26,345.21
Air Services	70,465,343.10	9,645,815.76
Canal Services	8,189,459.70	1,790,202.55
Marine Services	26,907,928.04	944,069.13
Railway and Steamship Service	28,247,185.18	224,007.78
Miscellaneous Services	13,355,788.24	92,206.10
Total—Departmental expenditures and revenues	149,137,075.50	12,722,646.53
Expenditures made by Department of Transport from funds provided by other departments or agencies	12,432,724.45	—
Grand Total	161,569,799.95	12,722,646.53



CANADA

Government
Publications

ANNUAL REPORT
for the Fiscal Year Ended
March 31, 1958

DEPARTMENT OF TRANSPORT
1957-1958

**Submitted under the provisions
of the Department of Transport
Act**



CANADA

DEPARTMENT OF TRANSPORT

ANNUAL REPORT

FOR THE FISCAL YEAR ENDED
MARCH 31

1958

Submitted under the provisions of the
DEPARTMENT OF TRANSPORT ACT

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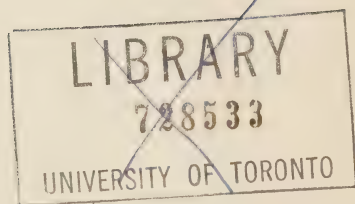


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*To His Excellency the Right Honourable Vincent Massey, C.H., P.C.,
Governor General and Commander-in-Chief of Canada.*

MAY IT PLEASE YOUR EXCELLENCY:

The undersigned has the honour to present to Your Excellency the Annual Report of the Department of Transport, for the fiscal year ended March 31, 1958.

GEORGE HEES,
Minister of Transport.

MINISTRY OF TRANSPORT

MINISTER

BOARDS, COMMISSIONS AND GOVERNMENT-OWNED COMPANIES

Air Transport Board
Board of Transport Commissioners
Canadian Maritime Commission
Canadian National Railways
Canadian National (West Indies) S.S. Co.
Canadian Government Merchant Marine, Ltd.
Canadian Overseas Telecommunication Corporation
National Harbours Board
St. Lawrence Seaway Authority
Steamship Inspection Board
Trans-Canada Air Lines

ACTS ADMINISTERED BY THE DEPARTMENT OF TRANSPORT

GENERAL

Bills of Lading Act
Canadian Overseas Telecommunication Corporation Act
Department of Transport Act
Pipelines Act
St. Lawrence Seaway Authority Act
Telegraphs Act
Transport Act

AIR SERVICES

Aeronautics Act
Carriage of Goods by Air Act
Radio Act

MARINE

Belleville Harbour Commissioners Act
Canada Shipping Act
Canadian Maritime Commission Act
Canadian National Steamships Act
Government Harbours and Piers Act
Government Vessels Discipline Act
Hamilton Harbour Commissioners Act
Live Stock Shipping
National Harbours Board Act

Navigable Waters' Protection Act
New Westminster Harbour Commissioners Act
North Fraser Harbour Commissioners Act
Port Alberni Harbour Commissioners Act
Toronto Harbour Commissioners Act
Water Carriage of Goods Act
Windsor Harbour Commissioners Act
Winnipeg and St. Boniface Harbour Commissioners Act

RAILWAYS

Canadian National Railways Act
Canadian National-Canadian Pacific Act
Canadian National Railways Financing and Guarantee Act
Canadian National Montreal Terminals Act
Canadian National Railways Pensions Act
Government Railways Act
Intercolonial Railway and P.E.I. Railway
Employees Provident Fund Act
Maintenance of Railway Operations Act
Maritime Freight Rates Act
Railway Act

AIR SERVICES

General

Substantial progress was made in the planning, design and development of new air terminal buildings, airports and runways and improved radio navigational aids, air traffic control and meteorological services generally, to meet the impending demands of the "Jet Age".

As a medium to provide for closer co-operation between Canada and the United States on civil aviation problems of mutual interest, a permanent joint committee of senior representatives of the U.S. Civil Aeronautics Authority and the Department of Transport Air Services was established, and two meetings were held during the year. The committee will normally meet twice a year, alternating between Ottawa and Washington.

Training

The continued expansion of civil aviation was reflected in the increased number of personnel licences in force at the end of the fiscal year, the greatest gain being in the private pilot category, which showed an increase of 15 per cent over the previous year.

Of the 3,096 private pilots licensed during the year, 2,317, were trained under the Department's program of assistance. Fifty-one flying clubs and 39 schools approved by the Department took part in this training program. Sixty flying instructors were graduated from two refresher courses sponsored by the Department and managed jointly by the Royal Canadian Flying Clubs Association and the Air Industries and Transport Association.

The Toronto Air Traffic Control School graduated 111 new controllers; staff requirements in the Western Region having been met for the present, the Winnipeg school was temporarily closed.

Five students successfully completed an M.A. course in Meteorology, given by the Meteorological Training Section in co-operation with the University of Toronto, and a second course with eleven students is proceeding. Preparations are also under way for a Meteorologist's refresher course.

As a result of continued difficulty in obtaining semi-professional employees such as radio operators, meteorological technicians, observers and air traffic controllers, plans are under way for establishing an Air Services Training School to meet the growing requirements in these fields.

Air Traffic Control

To keep pace with the constant increase in air traffic, the air traffic control service was re-organized and, on April 1, 1957, became a division with increased establishment to provide the required services.

One new control tower was commissioned—at Frobisher, N.W.T. Landings and take-offs controlled by the Department's 27 towers totalled 2,838,066, an increase of 26.6 per cent over the previous year. Of this total, 76.7 per cent were civil and 23.3 per cent were military.

Installation of surveillance radar equipment was commenced at Vancouver and Ottawa, the first of 15 planned for locations across the country. These units will enable traffic controllers to see small aircraft up to 100 miles, and transport-type aircraft up to 150 miles at altitudes up to 60,000 feet. Of the four smaller radars purchased for training and short range work, two went into operation—at Montreal and Toronto—and installations have been completed and tests started at Winnipeg and Vancouver.

Approach control service was installed at Edmonton and Frobisher. These units, which are also in operation at Ottawa, North Bay and Winnipeg, provide standard IFR separation to aircraft operating in accordance with the instrument flight rules within a specified area.

Five sets of altitude assignment apparatus were obtained and installations made between Montreal centre and Ottawa approach control; Goose centre and Goose approach control; and Edmonton centre and Calgary approach control. Installations will also be made at Winnipeg and Gander airports. This equipment adds to the safety and efficiency of air traffic control, providing a 'push-button' system of relaying altitude availability information, hitherto transmitted by telephone.

A remote transmitter and receiver, providing direct pilot-to-controller communication, were installed at London, Ont., and controlled from the Toronto centre to serve the southwestern Ontario area where air traffic activity is very heavy.

Extensive training of personnel and provision of equipment and communications were undertaken for setting up an Aircraft Movement Information Service (AMIS) to assist the Department of National Defence in establishing the identification of all aircraft operating within specified areas. AMIS sections will be set up in each area control centre beginning April 1, 1958, completion being expected early in 1959.

Aircraft Accident Investigation

As a result of the growth in complexity and importance of aircraft accident investigations, a separate division of specialists in that field was established in the Civil Aviation Branch during the year.

Of the 396 accidents involving Canadian aircraft engaged in civil flying, 73.2 per cent were attributed to personnel error, a decrease of 1.6 per cent over the preceding year. There was also a decrease of 1.8 per cent in material failures. Accidents due to weather increased by 0.8 per cent, and to undetermined causes by 1.7 per cent.

The ratio of accidents to the number of commercial aircraft registered increased by 2.18 per cent, whereas the number of such aircraft registered increased by 7.4 per cent. With an increase of 19 per cent in the number of private aircraft registered, the number of accidents increased by 2.45 per cent.

Air Carriers

Of the 401 air carriers operating in Canada, 239 were Canadian and 162 were foreign and Commonwealth operators.

Airport Revenues

Revenues totalled \$6,888,886, an increase of \$187,386 over the previous year.

Airport Development

Construction of airports at Halifax, Williams Lake, B.C., and Aklavik progressed, and new airports were commenced at Riviere du Loup, Sault Ste. Marie, Edmonton and Prince Rupert.

The program of providing new runways, taxiways and aprons, as well as lengthening and strengthening similar existing facilities to accommodate the new and larger types of aircraft, continued. Work included completion of projects started in previous years at Quebec, Timmins, Toronto (Malton), Yorkton, Beaverlodge, Fort Smith, Yellowknife, and Prince George, and continued at Gander, North Battleford, Swift Current, and Lethbridge.

Projects were commenced and completed at Matane, Sioux Lookout, Winnipeg, Dauphin, Port Hardy and Vancouver, and commenced at Torbay, Yarmouth, Moncton, Fredericton, Forestville, Montreal, London, Windsor, Toronto (Malton), Sudbury, Timmins, Red Lake, Brandon, Winnipeg, Calgary, and Quesnel. Surveys were made for new airports at Sherbrooke, Que., Flin Flon, Peace River, Medicine Hat, and Westview, B.C.

Terminal buildings at Windsor, Ont., Stephenville, Nfld., and Quebec, Que., were completed, and substantial progress was made at Gander, Torbay, Montreal, and Ottawa. To provide temporary relief from congestion at terminal buildings, an extension was made to the Winnipeg terminal building and planned for Toronto (Malton), and a new Customs Building was constructed at Montreal (Dorval). A contract was let for a new terminal at Halifax, and new terminals for Toronto (Malton), Winnipeg, Regina, and Port Hardy are in the planning stage.

Power and Lighting

Airport lighting development was carried out at 26 locations, and power facilities were established at 18.

Radio and TV

The number of radio stations increased by approximately 6,500, bringing the total to about 55,000. Included in this number are stations operated by federal, provincial and municipal governments, stations on ships and aircraft, mobile stations, and DEW and Mid-Canada Line projects.

Twelve private commercial broadcasting stations (television) commenced operation, five of which were low power television rebroadcasting stations using "off-the-air" pick-up.

Monitoring Stations

The Vancouver monitoring station relocated at Ladner, B.C., was commissioned and the Melville, Sask., station also went into operation. With construction started on a new station at the Lakehead, Ont., the relocation of the Winnipeg station went into its final phase. Plans are under way for relocating the Hartlen Point, N.S., station in Prince Edward Island.

Specifications were drawn up and contracts awarded for the construction of a mobile monitoring station. This will enable the investigation of technical and operational aspects of emissions not possible from fixed stations. The unit will consist of a 20-foot tractor-trailer, completely equipped with power, heating and air conditioning facilities, and capable of operating almost anywhere in Canada.

Spectrum policing was stressed during the year and many reports from the monitoring stations showed the necessity for better frequency utilization by the licensees, both from a technical and operational aspect. Since proper operating techniques contribute to spectrum conservation, these reports will be used as a basis for conducting an educational program.

Monitoring stations participated jointly with the Defence Research Board in radio-tracking two of the Russian earth satellites as part of the International Geophysical Year program.

Interference Suppression

The Department's 63 cars equipped for the investigation of interference located 11,819 sources, and suppression was obtained in all but a few cases. Power lines continued to be the largest single source, constituting 38 per cent of the total.

With the continued expansion of television service, reports of interference to reception again increased. Cases attributable to defective receivers rose 28 per cent and those to TV boosters rose 115 per cent. Interference caused by poor receiver design and radiating receivers both declined, the latter by 54 per cent.

New equipment has been procured for the investigation of interference and has been installed in a number of cars.

Radio Aids to Navigation

To meet continued increasing demands for marine and air navigation aids, additional facilities were installed in various parts of the country, and a number of existing facilities were extended and modernized.

At Sandspit, B.C., and Chesterfield Inlet, N.W.T., air and marine facilities were combined, and work progressed on the Aeradio-Marine Radio station at Churchill, Man.

An Aeradio station was established at Brandon, Man., which also controls a satellite station at Rivers. Additional marine communications are planned for Resolute, N.W.T., to meet the requirements of vessels engaged in northern supply operations.

To provide communication facilities on newly established TransAir Ltd. routes between Churchill and Montreal, and Churchill and Winnipeg, additions were made at Montreal, Ottawa, Timmins, Churchill and The Pas.

Radio facilities to serve a direct airway from Edmonton to Vancouver are being planned, and site selection for two radiobeacons along the route is under way.

A new coast station was commissioned at Fox River, Que., replacing Fame Point station.

Plans for taking over the operation of the Yukon and Northwest Territories radio system, now operated by the Royal Canadian Corps of Signals, and for the expansion of Frobisher into a key communications station for the Eastern Arctic, are well under way.

Site selection and flight testing of new VOR installations continued with additional sites being selected at Sydney, Halifax, and Yarmouth, N.S.; Saint John, Fredericton, and Moncton, N.B.; and Charlottetown, P.E.I. Preliminary VOR site selections were carried out at Port Hardy and Sandspit. The VOR sites at Wiarton, Winnipeg, Brandon and Broadview were commissioned. Altogether VOR facilities have now been installed or are in the process of being installed at 27 sites. Airway planning and implementation for the utilization of these facilities were carried out.

In co-operation with the United Kingdom, evaluation trials of Dectra as a trans-Atlantic air navigation aid continued. To determine user interest in a system of short-range navigation as an aid to shipping, known as Decca, stations with three satellites each were authorized for installation at Halifax and Quebec.

Radio Inspections and Examinations

Radio stations inspected numbered 13,547, which included 131 surveys of Canadian and foreign ships.

From 3,916 examinations for radio operators certificates of proficiency, 3,694 new certificates were issued.

Trans-Atlantic Cable

The first trans-Atlantic telephone cable system, jointly owned and operated by the British General Post Office, the American Telegraph & Telephone Co., and the Canadian Overseas Telecommunication Corporation, which opened in September 1956, continued to give excellent service, the demands for which are steadily rising. Since available circuits are insufficient, plans are advanced for the laying of a cable between Canada and the United Kingdom to be wholly Canadian and British owned and operated. The cable will provide sixty additional telephone circuits between the two countries, a number of which will be extended to provide connections with the principal countries of the European Continent. Completion is expected in 1961.

Telecommunications Revenue

Revenue from all sources, including messages handled through marine radio and aeronautical stations, and the Government telegraph and telephone service, totalled \$1,597,682.93 and in addition, \$443,050 was collected for the CBC from licences issued for private and commercial broadcasting stations.

Government Telegraph and Telephone Service

Further reduction of the Government telegraph and telephone service consisted of the sale of all mainland lines and facilities in the Province of Quebec to Quebec-Telephone and its subsidiary, the Bonaventure and Gaspé Telephone Company; lines in Cape Breton north of Englishtown and north of Port Hawkesbury to the Maritime Telegraph and Telephone Company; the closing down of the remaining line in Western Canada, between Peace River and Fort Vermilion; and the transferring of submarine cables between Prince Edward Island and the mainland to Canadian National Telegraphs.

Lines in New Brunswick and Cape Breton were renovated and extended to meet service demands, and unattended dial telephone exchanges were installed in the Amherst and Alright areas of the Magdalen Islands.

Northwest Communication System

Service on the Northwest Communication System was extended from Watson Lake to Cassiar Asbestos Mine. Additional landline carrier equipment and public radio facilities were added to the system to meet increasing demands for service.

The total cost of operating and maintaining the system was \$2,148,800; revenue earned amounted to \$3,018,087.

System facilities were expanded by means of high frequency carrier facilities to provide nine additional telegraph channels between Edmonton and Whitehorse and ten additional telegraph channels between Dawson Creek and Fort St. John.

Meteorological Services

The growing volume of air traffic, the introduction of aircraft capable of higher or longer-range flights, and new routes established increased the demands for meteorological services. Although serious operating difficulties resulted from the continued shortage of forecasters, all major commitments were carried out.

Regular forecasts were issued four times daily for all settled areas, and for inland lakes and coastal waters. Supplementary forecasts were supplied to serve agricultural, forestry, industrial and other interests. Special weather services were provided for fruit, vegetable and tobacco growers. The forecast office at Frobisher was taken over from the Department of National Defence, and the Knob Lake office was closed.

The 13 principal aviation forecast offices issued on routine basis, for distribution by teletype, more than 76,000 regional forecasts, 11,000 high level wind forecasts, and 165,000 terminal forecasts during the year. In addition, the other offices issued on a regional basis for local distribution, more than 11,000 regional and 78,000 terminal forecasts.

The growth and expansion of airport installations has created a problem in providing adequate meteorological briefing for crews. The possibility of using closed circuit TV to meet this need is being explored.

1957 was the first full year of operation of the Decca 41 weather radar at Malton. Plans were well advanced for the purchase and installation early in 1958 of a second Decca 41 for Vancouver.

Services for international aviation are now provided by Main Meteorological Offices at Vancouver, Winnipeg, Toronto, Montreal, Goose and Gander, in co-operation with offices in foreign countries, for routes spanning both the Pacific and the Atlantic Oceans and extending south to South America. Through the medium of I.C.A.O. and by direct consultation, the Meteorological Branch participates with airlines and other countries in the development of the procedures and facilities required.

"Met" Communications

The meteorological teletype system was expanded by 5,800 miles, making a total of 39,100 miles of circuit, and the Canadian weatherfax was increased from 12,700 airline miles to 13,900, including Regina, Victoria, Lakehead and Hamilton in this system. To meet increased demands for analyzed maps, the transmission speed was doubled—from 60 to 120 revolutions per minute.

The trans-Atlantic full duplex teletype circuit, established on an experimental basis between British and Canadian Meteorological Services for the exchange of weather reports, was placed on a continuing basis, with the cost being shared equally between the two services.

Another major teletype advancement was the acquisition of a full duplex circuit in the DEW Line network, linking the Edmonton District Aviation Forecast Office and the Goose Main Meteorological Office.

Special Projects

The research program for the International Geophysical Year commenced on July 1, 1957, with ozone observations at Alert, Resolute, Edmonton and Moosonee, radiation measurements at over 20 stations, and a detailed program of physical meteorological investigation at Resolute. Results are made available to the IGY data collection centre in Geneva, Switzerland.

A program of Aerial Sea Ice Reconnaissance in Canadian waters was set up and plans were completed for the establishment of a Sea Ice Central at Halifax (Shearwater). Ice observers were trained and meteorological advice was provided to the RCAF and RCN in carrying out their reconnaissance flights.

Plans were completed for establishing a Hydrometeorology Section in the Climatology Division, and arrangements were made for seconding a meteorologist to assist in the Prairie Farmers Rehabilitation Act project.

The Alberta Hail Studies Project was continued and expanded, in co-operation with the Alberta Research Council, the National Research Council, and McGill University.

Instrument Production

The production of weather instruments continued at a high level. The new Canadian radiosonde was made available for the first time, and the first Canadian absolute standard barometer was built and tested.

CANAL SERVICES

Navigation

From early in April until mid-December twenty-four-hour-a-day navigation is provided throughout the Main Line Canals, which are situated along the St. Lawrence River and through the Great Lakes.

Further experimental work in combatting ice formation was carried out. Compressed air was used to clear ice from the lockgate recesses of the Lachine and Soulanges Canals. A flowdeveloper was used to clear the ice at the upper entrance of Lock 4 on the Lachine Canal. Before the opening of 1958 navigation, the upper entrance of the Sault Ste. Marie Canal was cleared by the air-bubble method of melting ice. Experiments with this method had been carried out on the Trent Canal during the winter months.

Traffic and Freight

Freight tonnage passing through the various main line canals decreased slightly from the 1956 record peak, but remained approximately 100 per cent higher than ten years ago. Of the following total freight traffic, approximately 86 per cent was carried by vessels of Canadian registry:

Canal	Freight (Tons)		Decrease Per Cent
	1957	1956	
Sault Ste. Marie	1,786,692	2,991,736	40.3
Welland Ship	22,373,869	23,066,261	3.0
Cornwall	11,384,060	12,872,466	11.5

(A comprehensive report prepared by the Public Finance and Transportation Division of the Dominion Bureau of Statistics in collaboration with Canal Services, giving a detailed analysis of freight and vessel movements throughout the various canal systems, is obtainable from the Dominion Bureau of Statistics, Department of Trade and Commerce, Ottawa.)

Foreign Vessels

Foreign vessels engaged in the lake trade increased to 133 from 125 the previous year; 351 trips were made as compared with 334 in 1956.

Hydraulics

The flow of water through the canals is regulated by means of a network of dams and weirs, which prevents flooding and maintains water supplies in natural reservoirs for distribution throughout the year for navigation, power generation and other interests. Ontario Hydro and other companies lease

considerable quantity of water for power development. As an example, some 6,400 c.f.s. of water is leased for the Ontario Hydro DeCew Falls plant, representing an annual revenue to the Department of approximately \$350,000.

Daily computations were made of the flow of water into each canal and its distribution throughout the water-way.

Construction and Engineering

Various engineering studies and investigations were carried out, involving field surveys and preparation of plans and specifications.

Piers and abutments for a new bascule bridge over the Lachine Canal at Ville St. Pierre were built under contract, and south Lock No. 3 was converted into a regulating weir.

Perth, with financial assistance from the Department, erected a new concrete bridge across the Tay River.

Maintenance

In addition to the usual items of maintenance, counterweight cables on three Welland Canal bridges were replaced.

A major program of reconditioning the southwest entrance pier, Sault Ste. Marie Canal, was commenced, and the refacing of the south lock wall was completed.

St. Lawrence Seaway and Power Project

Close co-operation was maintained with the St. Lawrence Seaway Authority and Ontario Hydro to facilitate construction work.

Planning for dismantling and removing lock equipment and buildings prior to flooding the International power head-pond at Cornwall on July 1 proceeded with close liaison with Ontario Hydro. Work continued on the multi-million dollar Seaway Authority dredging program on the Welland Ship Canal. Navigation regulations and canal operations were adjusted as required to facilitate work of the various contractors, and canal equipment and services were made available when required.

MARINE SERVICES

Construction

New major light and fog-alarm stations are nearing completion at Keppel Island, Nfld., and Cap Bon Desir, Que. Twenty-three new lightstation dwellings, six major light towers, and eight fog-alarm buildings were constructed, and the Montreal Pilotage building was completed.

Concrete piers were designed and erected for navigation lights to be established in the International Section of the St. Lawrence Seaway and a contract was let for the construction of light piers in the Lake St. Francis area. In addition, a number of new shore lights were established, existing light structures relocated, and the overall program of aids for the Seaway is continuing.

Work was started on a new office and stores building for the Halifax Marine Agency, and preliminary site and design studies were made for similar buildings in the District Marine Agencies at Saint John, N.B., and Charlottetown, P.E.I. Reconstruction of Queens Wharf at Quebec was completed and work commenced on the new Agency wharf at Saint John. A site investigation was made for the construction of unloading facilities at Frobisher Bay, and preliminary engineering studies were carried out for a new lighthouse pier to replace the old lightship at Prince Shoal in the St. Lawrence River below Quebec.

Continuing the program of improving living conditions for lightkeepers and their families at isolated lightstations, 18 diesel electric generating units were supplied at locations where commercial hydro is not available. In addition to improving the navigation lights, these units provide power for domestic lighting, water systems, and electrical appliances.

Two more mobile cranes were supplied to District Marine Agency depots to facilitate the handling of buoys and other heavy equipment.

Research

National Research Council and Departmental engineers are co-operating closely in the application of electronic systems to the operation of navigation lights and fog alarms. An installation of this type has been in operation at Barrett Rock fog alarm, B.C., since 1952 and an improved micro wave system is now being installed on an experimental basis at Pelee Passage in Lake Erie.

A synchronous-type hydro operated flasher, featuring constant speed operation and provision for all flashing and coded light characteristics, was designed and built at Prescott at considerably less cost than commercially-built timers. The photocell-operated sunswitch, designed for low voltage direct current use, was further developed to control both hydro-power main lights and battery standby lights. Both the timer and photocell switch have been successfully tested in the Prescott shops and will be put on trial operations in the field for further proving before adoption.

Harbour Commissions

The incorporation of the Windsor Harbour Commissioners by Federal Statute during the year increased the number of active Harbour Commissions to eight.

Revenues

Harbour dues collected from the 320 public harbours under the jurisdiction of the Department totalled \$159,010. Rentals from water lots amounted to \$28,650; wharfage collections amounted to \$744,145, an increase of \$60,037 over the preceding year.

Vessel Registration

At the end of 1957 there were 18,294 vessels of 2,358,352 gross tons registered in Canada; 1,120 vessels were added to the register and 479 removed, making a net gain of 641.

Under the Small Vessel Licensing Regulations, 38,933 small vessels, exempt from registry, were licensed, making a total of 198,958 small vessel licences issued at the end of 1957.

Air-Sea Rescue

The grant to the B.C. Towboat Owners' Association was raised to \$15,000. Under an agreement with the Department, the Association provides a marine adviser and assistant to co-ordinate air-sea rescue facilities with the services of tow boats operating on the British Columbia coast. Financial assistance from the Department helps to cover salaries and office maintenance expenses.

Pilotage

In the nine districts for which the Minister is the authority, there were 347 licensed pilots, who performed 38,142 pilotages inward or outward and 10,082 movages. A gross amount of \$3,764,395 was earned in fees.

Examination of Masters and Mates

Examinations held for Masters, First Mates and Second Mates Certificates of Competency and Service totalled 931, and 457 Masters, 119 First Mates, and 87 Second Mates were issued with certificates.

Navigation Schools

During the winter months, navigation schools were fully maintained by the Department at Quebec and Prince Rupert.

Financial aid was provided to assist navigation schools under local education authorities at Halifax, Saint John, Montreal, and Vancouver. Because of the very small attendance, the grant to the school at Saint John was discontinued in December.

Navigation schools are maintained by local education authorities and other organizations at St. John's, Nfld., Grindstone and Rimouski, Que., and Toronto, Midland, Collingwood and Owen Sound.

Marine Accidents

A formal investigation of the stranding of the C.G.S. *Baffin* off the coast of Nova Scotia was held on July 4, 1957. Preliminary inquiries into five other incidents were also held.

Ship Repairs and Maintenance

Repairs and maintenance carried out on 30 of the Department's lake and sea operating fleet totalled \$1,464,215.

New Construction

Three new ships were completed: C.G.S. *Montmorency*, a supply and buoy vessel for service at Quebec; C.G.S. *Nokomis*, a workboat for service at Port Arthur; and the *Lord Selkirk*, an auto ferry for service between Wood Island, P.E.I., and Caribou, N.S.

New construction on hand includes: three icebreaker, supply and buoy vessels, two for the east coast and northern waters, and one for the west coast and western Arctic; five supply and buoy vessels, three for service on the east coast, one for the west coast, and one for the Great Lakes; one sounding vessel and one survey vessel for the St. Lawrence Ship Channel; an icebreaker for service at Quebec and in northern waters; a buoy vessel for service at the Sorel Agency; a lightship for service at Quebec; two shallow draft vessels for service in the Northwest Territories; *Pilot Boat No. 6* for service at Saint John; and conversion of C.G.S. *Labrador* from Navy to civilian operation.

Design plans on hand but not completed are for an auto and passenger ferry for service between Pelee Island and Leamington on the Great Lakes, and one for service between Portugal Cove and Bell Island, Nfld.

Northern Operations

The *Ernest Lapointe* was the first ship to go north this year, sailing for Goose Bay on June 13 with 45 tons of general cargo; buoys and aids to navigation were also placed in position. The C.G.S. *C.D. Howe* followed, sailing from Montreal on June 27 on her eighth Eastern Arctic Patrol, with 1,079 tons of cargo. The C.G.S. *Edward Cornwallis* and the C.G.S. *N.B. McLean* sailed from Montreal on July 10 with 782 and 613 tons of cargo, respectively. Making a total of 40 ports of call, the *N.B. McLean* returned to Quebec on November 26 after completing her longest Arctic voyage to date.

Operation "Nors 57" commenced with the sailing of the *d'Iberville* from Montreal on July 23 with 360 tons of cargo for Resolute and Eureka. The vessel formed convoy with S.S. *Kingsbridge* and M.V. *Sea Transporter*, returning to Quebec on September 9 with all assignments completed.

The *Ernest Lapointe* made another trip to Goose Bay to close the Port, leaving Montreal on November 12 with 30 tons of cargo.

In addition to the Government vessels, twelve commercial ships carried 10,770 tons of cargo to various stations in the North. In all, over 27,854 tons of cargo and approximately 312 passengers were carried during the 1957 season, and all cargo was successfully delivered.

Aerial Ice Survey

The annual spring aerial investigation of ice conditions in the River and Gulf of St. Lawrence and on the east coast was again carried out in co-operation with the International Ice Patrol.

The Department also sponsored aerial ice surveys over Hudson Bay and Strait for the third year, over the Strait of Belle Isle for the second year, and for the first time, on an experimental basis, over the Lower St. Lawrence from Quebec City to Anticosti Island.

St. Lawrence Ship Channel

The C.G.S. *Ernest Lapointe* was employed on surveys and supervisory duties all season with the exception of fall and spring trips to Goose Bay and brief periods of service with the Quebec Marine Agency. The *Berthier*, *Frontenac*, and *Detector* operated at full capacity.

Dredging between Montreal and Quebec, part of a four-year widening project, was slowed down because of priority demands for contractor's equipment on the St. Lawrence Seaway, and for work in Montreal Harbour in preparation for an expected traffic increase when the Seaway is opened.

Investigations were made and data gathered for the suggested moving of Cap Brule range and for the movement of the course from the lower end of St. Michel-Brule Bank Channel to Cap Bribranne. Detailed surveys were made of the proposed National Harbours Board oil terminal site, four miles east of Chicoutimi. Major dredging operations were continued in Montreal Harbour under Ship Channel supervision.

Icebreaking

Weather remained seasonable throughout December and late sailings were convoyed by Departmental icebreakers without difficulty, the last ocean ship departing from Montreal on December 18.

With low temperatures setting in early in January, the Departmental icebreakers were fully occupied in the St. Lawrence River and Gulf, the Saguenay River, the Maritimes and Newfoundland. The work included assisting vessels in and out of Dalhousie, N.B., and Quebec, Que. This was the first time winter navigation had been carried out to Quebec.

No jams developed between Quebec and Three Rivers, the area being free of heavy ice formation. All ice broke up gradually with practically no inconvenience to shipping.

On March 18 the *d'Iberville* cleared the passage to Montreal Harbour after breaking through the heaviest ice barrier experienced in many years. The first ocean ship docked in Montreal on March 20 and by April 6 the channel from Quebec to Montreal was considered safe for daylight navigation. No icebreaking was required on Lake St. Louis and the Lachine Canal opened on April 17. The *d'Iberville* began clearing the Saguenay River on March 22, opening Port Alfred Harbour to ocean shipping on April 5.

STEAMSHIP INSPECTION SERVICE

Regulations

New Life Saving Equipment Regulations, and Hull Construction Regulations were brought into effect. A more extensive use of inflatable life rafts as statutory life saving equipment in ships is under consideration. No action is being taken, however, until suitable repair and maintenance depots are set up by the suppliers of such equipment.

Small Vessel Regulations, embodying all Departmental requirements for small craft, have been promulgated. This will enable the R.C.M.P. and other peace officers to carry out their enforcement and safety programs more effectively. As a result of a voluntary program developed in conjunction with the boat manufacturing industry, boat builders may now obtain plates, showing recommended safe load and horsepower for a particular outboard motor boat, for affixing to the boat.

The Dangerous Goods Shipping Regulations required major revisions in keeping with the expansion and development of the chemical and explosives industries and the many new products and packing materials coming into use.

Regulations covering the prevention of pollution of navigable waters by oil from ships have been widely promulgated, and an enforcements organization is being set up.

Inspections

A total of 1,802 ships, of 1,440,059 total gross tonnage, were inspected; 27 ships were inspected during conversion or reconditioning; and 24 were inspected at the request of other countries.

The year was fairly active for the shipbuilding industry, 103 new ships having been constructed and completed under inspection.

Of the 3,730 inspections of ships' tackle carried out, 488 cases required repair, adjustment or testing of cargo handling gear or equipment in the interests of safety.

Examination of Engineers

Certificates of Competency as Marine Engineers were granted to 879 candidates, which included 223 steam, 223 motor, 60 combined steam and motor, and three steam certificates having United Kingdom validity.

Marine Engineering Schools and Training

At the five Marine Engineering Schools in the operation of which the Department participates in conjunction with the Provincial Governments of Newfoundland, Nova Scotia, and Quebec, and the Dominion Marine Association in Ontario, there were 230 enrolments, with 185 students being granted certificates of competency.

The Department's Marine Engineering Training Scheme, now in its second year, is proceeding according to plan. In the spring of 1957 all trainees successfully passed the final examinations of the evening class courses. In June, the trainees had their first special technical course at the Dominion Marine Association Engineering School in Toronto, and all successfully completed their final tests.

RAILWAY SERVICES

Canadian National Railways

The Canadian National Railways operated at a deficit of \$22,072,541, compared with a surplus of \$26,076,951 in 1956.

Canadian National (West Indies) Steamships Ltd.

Canadian National (West Indies) Steamships Limited operations were curtailed by a strike called by the Seafarers' International Union on July 4. The failure of prolonged negotiations to effect a settlement resulted in a decision to sell the ships and abandon the service.

The number of voyages made was reduced to 33 from 54 in the previous year, producing a deficit of \$648,850 compared with a surplus of \$23,281 in 1956.

Hudson Bay Railway

Hudson Bay Railway operations produced a cash deficit of \$579,950 before depreciation, compared with a surplus of \$34,298 in 1956. Some 16,796,500 bushels of wheat for export were handled, a decrease of 480,800 bushels from the previous year. Passenger traffic, however, was higher, the 55,744 passengers carried being 9,444 more than the previous year.

A change was made in the entrustment of the Railway to the Canadian National Railway Company for management and operation, effective January 1, 1958, whereby the Hudson Bay Railway was placed on the same status as other Canadian Government railways entrusted to the Company for management and operation.

Prince Edward Island Car Ferry and Terminals

The deficit in the operation of this service for the year amounted to \$2,027,639 compared with a deficit of \$1,804,287 for the previous year.

The movement of highway vehicles to and from Prince Edward Island continues to increase. In 1957 a total of 140,278 vehicles were carried, an increase of 11,889, or approximately 9 per cent over 1956.

Cabot Strait Ferry Services

In addition to the regular freight and passenger ferry service operating between North Sydney, N.S., and Port aux Basques, Nfld., the MV. *William Carson* provided a freight service throughout 1957 between North Sydney and Argentia, Nfld., pending completion of harbour improvements at Port aux Basques. The operation of extra ships between North Sydney and other Newfoundland ports was necessary to relieve the congestion of freight moving through North Sydney to various points in Newfoundland. The deficit in the operation of these services amounted to \$5,978,398.

At March 31, 1958, total expenditures on new terminal facilities at North Sydney and Port aux Basques amounted to \$9,729,513.

Yarmouth-Bar Harbor, Me., Ferry Service

This service operated at a deficit of \$278,094 compared with a deficit of \$304,350 for the previous year. Traffic increased by approximately 3 per cent.

Canso Causeway

Construction of the Causeway was practically finished by March 31, 1957, with only a few minor items remaining to be completed. Expenditures during the year amounted to \$142,920, bringing the total cost of construction to \$20,098,904 at March 31, 1958.

Railway Subsidies

Subsidies paid by the Government of Canada towards the construction of railway branch lines amounted to \$2,000,000. Of this the Canadian National received \$1,250,000 towards the construction of the Beattyville-Chibougamau-St. Felicien branch line in the Province of Quebec. Subsidy payments to March 31, 1958, totalled \$5,225,000 for 209 miles of completed line.

A payment of \$750,000 to British Columbia completes the Government's agreement to subsidize the first 50 miles of the Pacific Great Eastern railway extension northward from Prince George, the total subsidy amounting to \$1,250,000.

FINANCIAL SUMMARY

Total expenditures during the year amounted to approximately \$208,000,000, including about \$11,500,000 from funds provided by the Department of National Defence and other government departments. The total expenditure was approximately \$47,000,000 higher than the previous year, due mainly to increased expenditures for construction work at airports and radio stations, ship building, and the operating deficit for the Canadian National Railways.

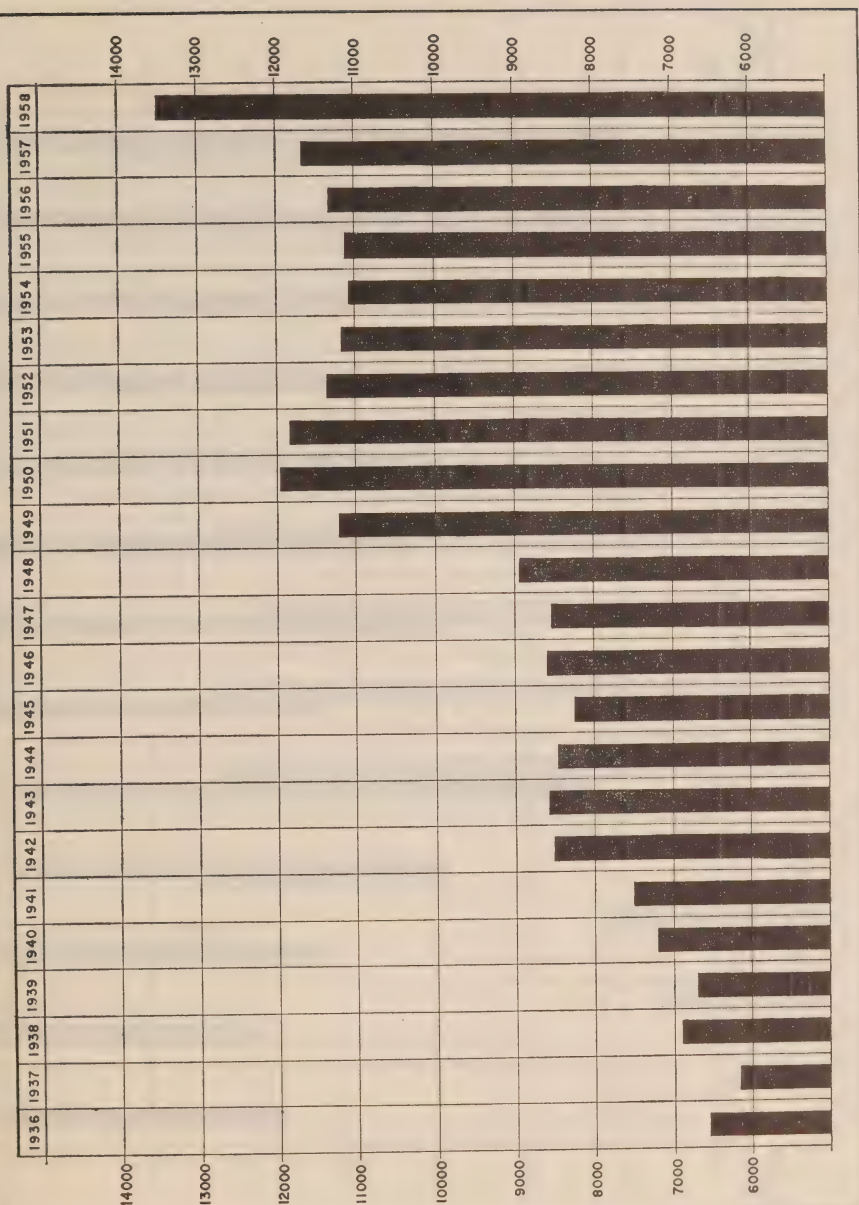
Revenues from all services totalled approximately \$13,300,000, compared with about \$12,700,000 the previous year. Air Services revenues were up by approximately \$400,000, due mainly to increased revenues from aircraft landing fees, rentals, and concessions at major airports, and to increased revenues in the Government Telegraph and Telephone Service. The Canal Services revenues were up by approximately \$200,000, due mainly to increased revenue from rentals.

Summary of Expenditures and Revenues

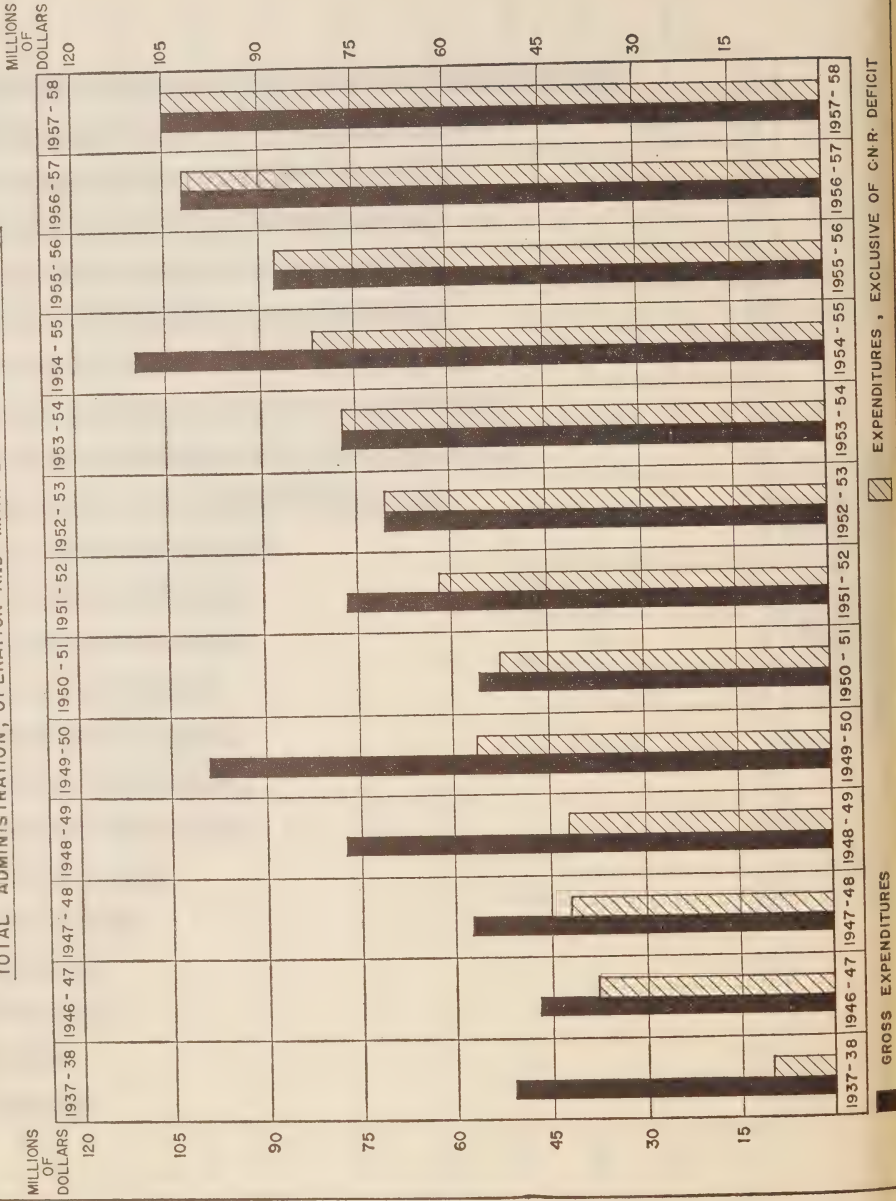
Fiscal Year 1957-58

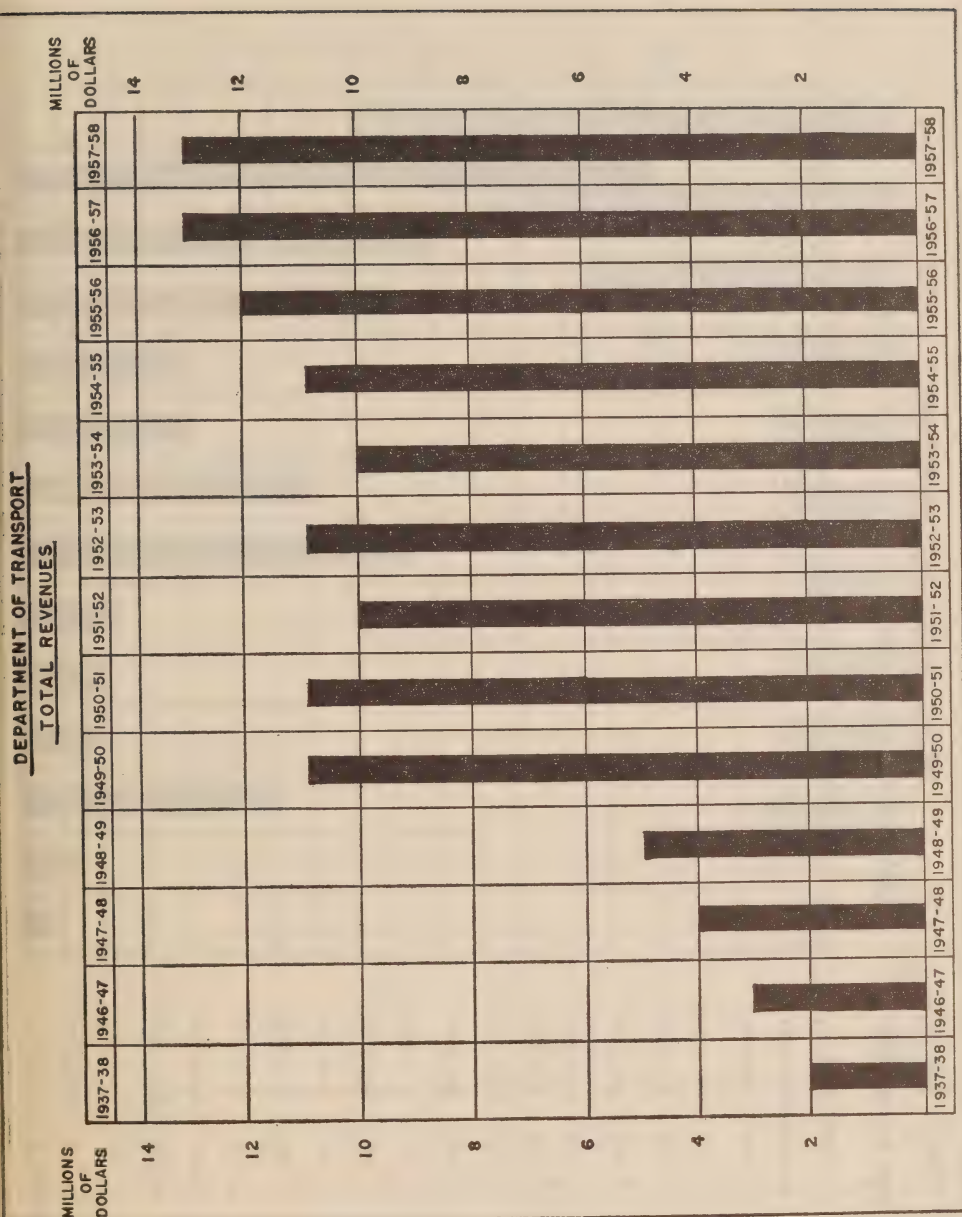
	Expenditures \$	Revenues \$
Departmental Administration	2,162,828.04	6,593.87
Air Services	90,275,491.06	10,019,449.76
Canal Services	8,620,585.37	1,984,717.25
Marine Services	32,825,148.88	1,034,214.20
Railway and Steamship Services	49,299,693.19	144,126.02
Miscellaneous Services	13,501,217.38	158,906.81
<hr/>		
Total—Departmental expenditures and revenues	196,684,963.92	13,348,007.91
Expenditures made by Department of Transport from funds provided by other departments or agencies	11,565,468.92	.....
<hr/>		
GRAND TOTAL	208,250,432.84	13,348,007.91

DEPARTMENT OF TRANSPORT

EMPLOYEE STRENGTH
1936 TO 1958

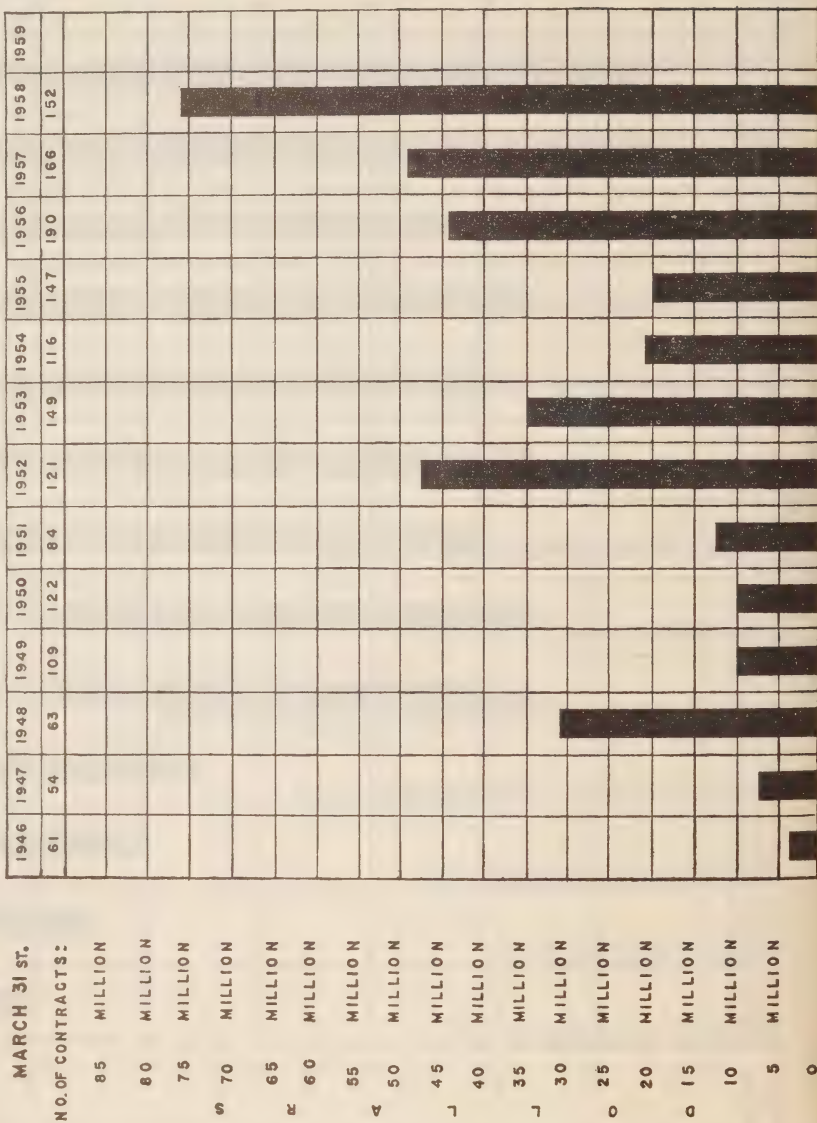
DEPARTMENT OF TRANSPORT
TOTAL ADMINISTRATION, OPERATION AND MAINTENANCE EXPENDITURES



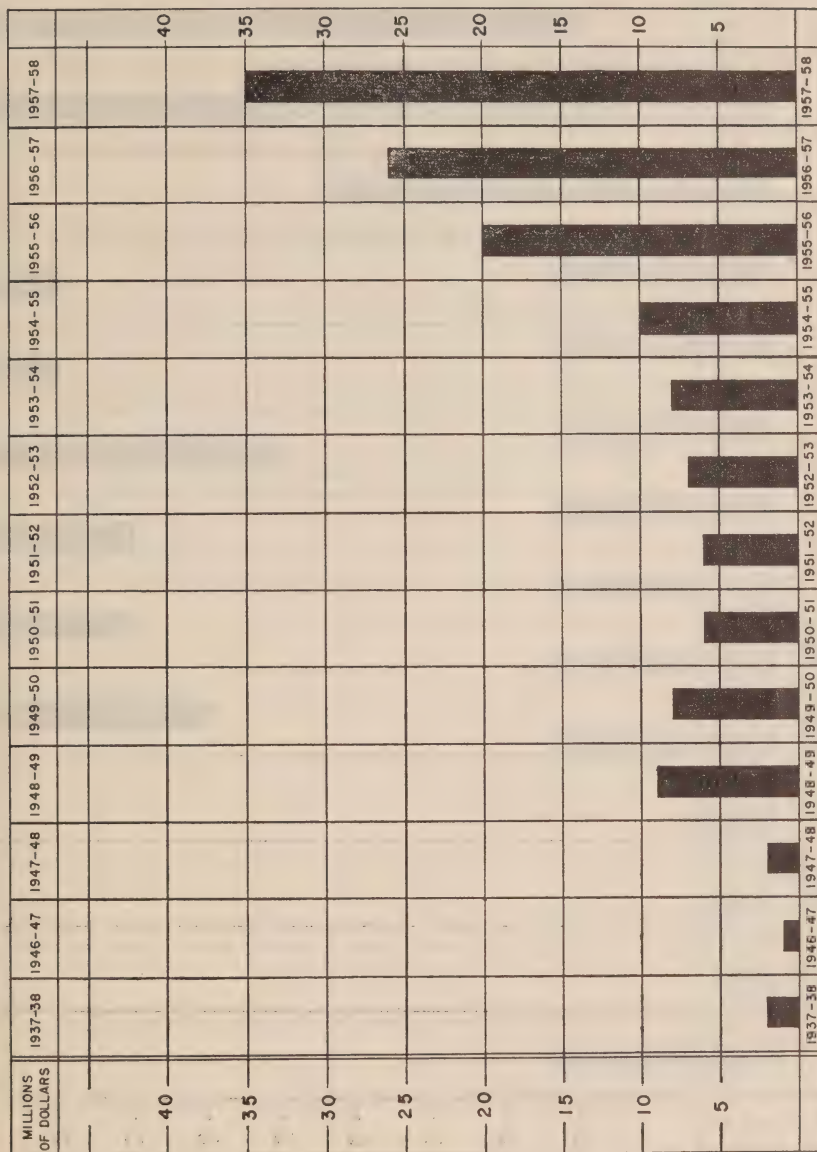


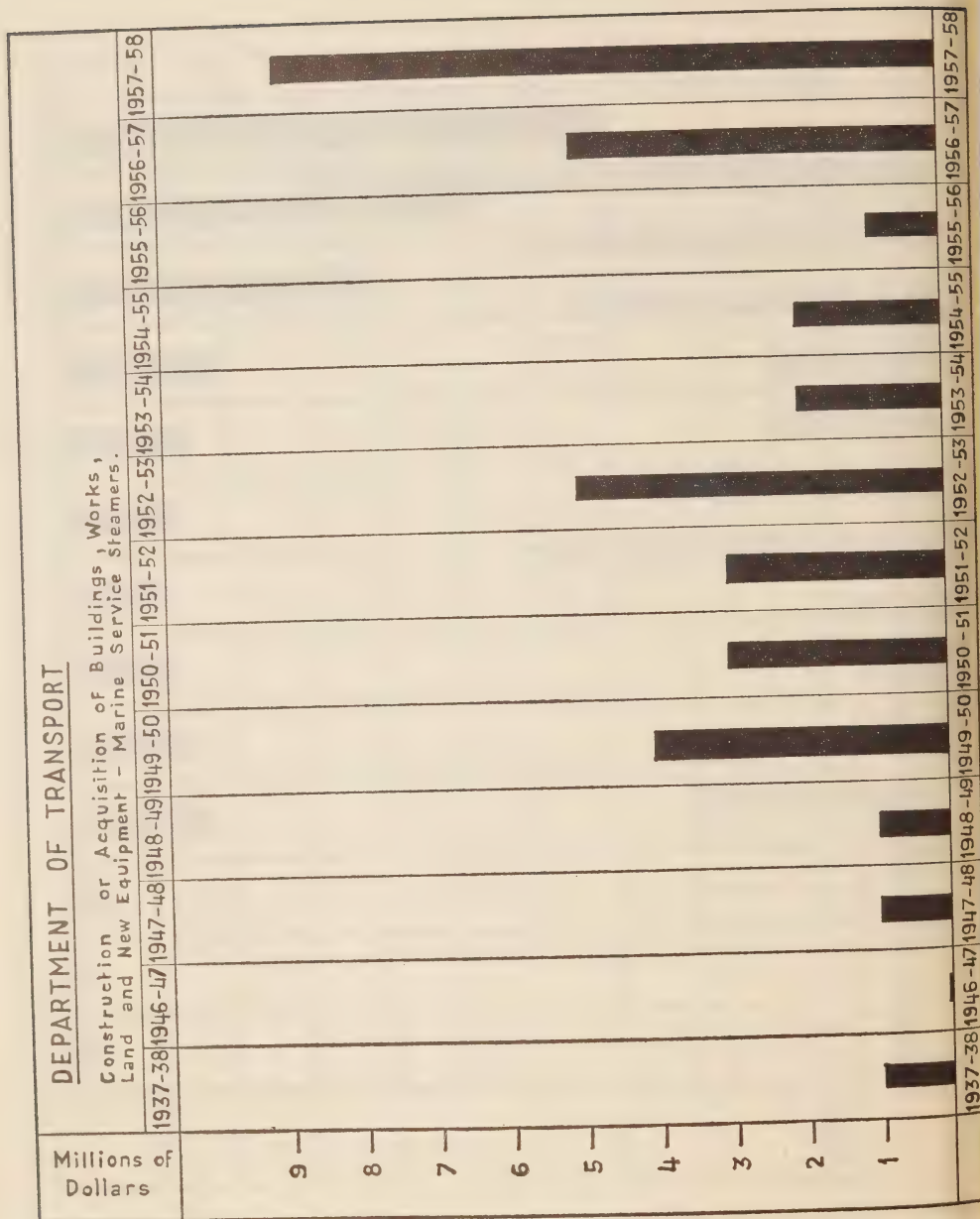
VALUE OF CONTRACTS
FOR YEAR ENDING

DEPARTMENT OF TRANSPORT
PURCHASING CONTRACTS & STORES DIVISION

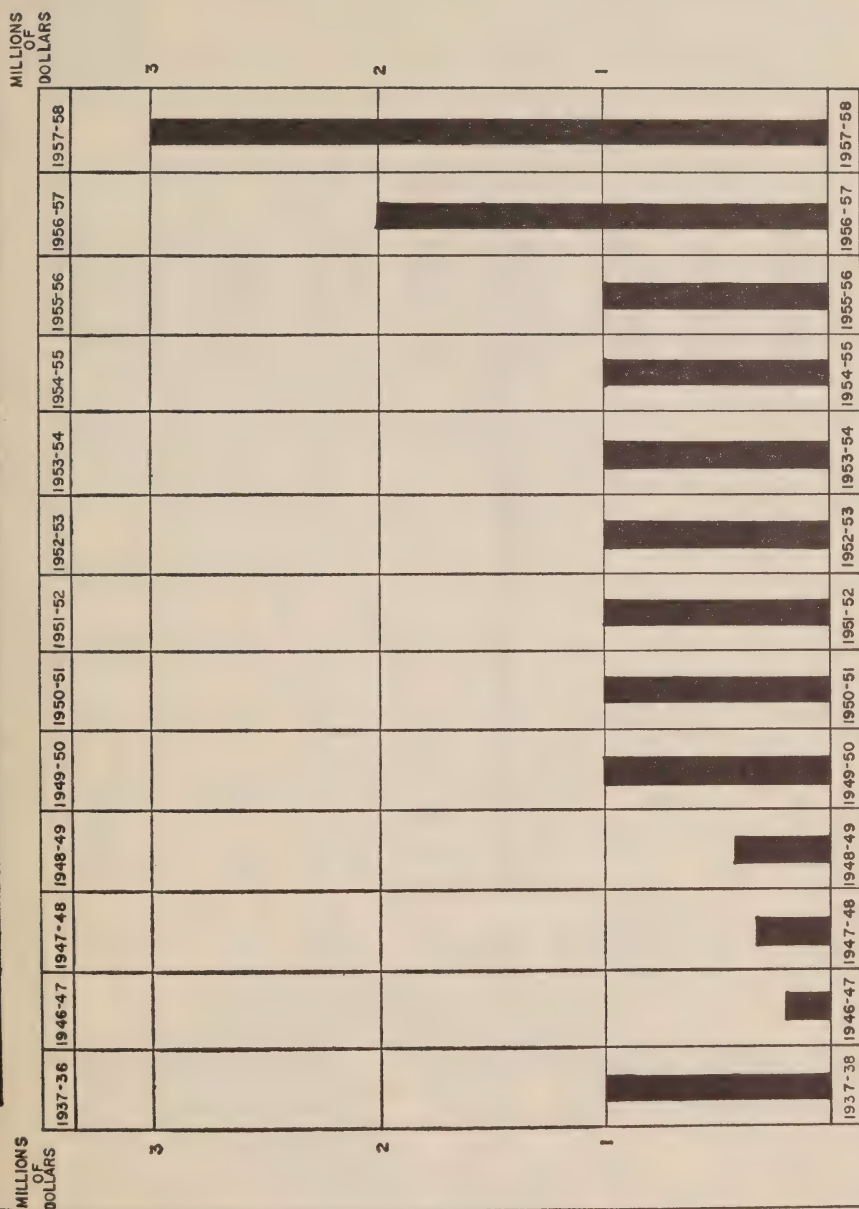


CONSTRUCTION OR ACQUISITION OF BUILDINGS, WORKS, LAND AND NEW EQUIPMENT — AIRPORTS





CONSTRUCTION OR ACQUISITION OF BUILDINGS, WORKS, LAND AND NEW EQUIPMENT-AIDS TO NAVIGATION





Government
Publications



DEPARTMENT OF
transport

**ANNUAL
REPORT
1958-59**

FISCAL YEAR ENDED MARCH 31, 1959

ANNUAL REPORT
Department of Transport





CANADA

DEPARTMENT OF TRANSPORT

ANNUAL REPORT

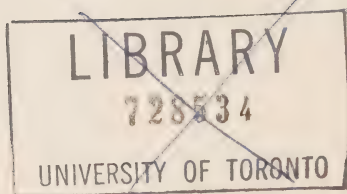
FOR THE FISCAL YEAR ENDED
MARCH 31

1959

Submitted under the provisions of the
DEPARTMENT OF TRANSPORT ACT

COVER PHOTO:

Transport Department's icebreaker *d'Iberville*
in the Arctic.



Price 50 cents Cat. No. T1-359
Available from the Queen's Printer
Ottawa, Canada

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*to His Excellency Major-General Georges P. Vanier, D.S.O., M.C., C.D.,
Governor General and Commander-in-Chief of Canada.*

[AY IT PLEASE YOUR EXCELLENCY:

The undersigned has the honour to present to Your Excellency the Annual Report of the Department of Transport, for the fiscal year ended March 31, 1959.

GEORGE HEES,
Minister of Transport.

MINISTRY OF TRANSPORT MINISTER

BOARDS, COMMISSIONS AND GOVERNMENT-OWNED COMPANIES

Air Transport Board
Board of Transport Commissioners
Canadian Maritime Commission
Canadian National Railways
Canadian National (West Indies) S.S. Co.
Canadian Government Merchant Marine, Ltd.
Canadian Overseas Telecommunication Corporation
National Harbours Board
St. Lawrence Seaway Authority
Steamship Inspection Board
Trans-Canada Air Lines

ACTS ADMINISTERED BY THE DEPARTMENT OF TRANSPORT

GENERAL

Bills of Lading Act
Canadian Overseas Telecommunication Corporation Act
Department of Transport Act
Pipelines Act
St. Lawrence Seaway Authority Act
Telegraph Act
Transport Act

AIR SERVICES

Aeronautics Act
Carriage of Goods by Air Act
Radio Act

MARINE

Belleville Harbour Commissioners Act
Canada Shipping Act
Canadian Maritime Commission Act
Canadian National Steamships Act
Government Harbours and Piers Act
Government Vessels Discipline Act
Hamilton Harbour Commissioners Act
Live Stock Shipping
National Harbours Board Act
Navigable Waters' Protection Act

New Westminster Harbour Commissioners Act
North Fraser Harbour Commissioners Act
Port Alberni Harbour Commissioners Act
Toronto Harbour Commissioners Act
Water Carriage of Goods Act
Windsor Harbour Commissioners Act
Winnipeg and St. Boniface Harbour Commissioners Act

RAILWAYS

Canadian National Railways Act
Canadian National-Canadian Pacific Act
Canadian National Railways Financing and Guarantee Act
Canadian National Montreal Terminals Act
Canadian National Railways Pensions Act
Government Railways Act
Intercolonial Railway and P.E.I. Railway Employees Provident Fund Act
Maintenance of Railway Operations Act
Maritime Freight Rates Act
Railway Act



Gander terminal building.

AIR SERVICES

General

Canada's continued growth and economic development, together with the additional facility requirements of the "Jet Age", caused a marked increase in aviation activities throughout the country during the year.

Substantial progress was made in planning, designing and constructing new air terminal buildings, airports, runways, improved navigation aids, air traffic control facilities and meteorological services generally.

A new directorate was planned to co-ordinate planning and programming all future major Air Services projects.

A Canadian Airworthiness Council was created to advise the Minister on aeronautical engineering, airworthiness, inspection, maintenance and certification of aircraft and related matters, with the chief aeronautical engineer, Civil Aviation Branch, as chairman. The other six members represent the aircraft industry.

Close liaison was maintained with the United States Federal Aviation Agency and two meetings of the joint standing committee were held—one in Ottawa and the other in Washington.

Training

The continued expansion of civil aviation was reflected in the increased number of personnel licences in force at the end of the fiscal year, the greatest gain being in the private pilot category which showed an increase of $12\frac{1}{2}$ per cent over the previous year.

Of the 3,217 private pilots licensed, 2,455 were trained under the Department's assistance plan. Sixty schools and 39 flying clubs approved by the Department took part in this training program.

A total of 60 instructors were graduated from two instructor refresher schools sponsored by the Department and managed jointly by the Royal Canadian Flying Clubs Association and the Air Industries and Transport Association.

An M.A. course in meteorology, given by the Meteorological Training Section in co-operation with the University of Toronto, was successfully completed by ten students in 1958. A second M.A. course with 21 students was in progress at the end of the year.

One course for meteorological officers was given during the year and a short series of refresher lectures was given to the Eighth National Conference of the Canadian Weather Service. A meteorologists' refresher course of three weeks' duration was held in Toronto in April, with 13 meteorologists in attendance.

Two meteorology schools went into operation during the year: one at Shearwater, N.S., and the other at Trenton, Ont. Weather training of some of the Mid-Canada Line operating personnel continued at a number of regional training schools.

From January 28 to March 11, 1959, the second training course for personnel selected for ice observers was given at meteorological headquarters.

During the year 72 radio technicians completed an eight-week training course on airport and airway surveillance radar maintenance. Other technicians were trained on marine radar maintenance, special aircraft installations, teletype maintenance and VHF techniques. Seven engineers took courses in VOR, ILS and radar at the Federal Aviation Agency Centre in Oklahoma City.

Some 550 radio technicians and radio operators were enrolled in a home study course on practical aeronautical electronics engineering.

The radiosonde training unit, consisting of two training schools (at Toronto and Edmonton), handled 54 trainees. Plans were initiated to consolidate the two schools at one location in Toronto. The National Research Council laboratory building at Scarborough, Ont., will house the school and the move to the new location is expected to be made late in the summer of 1959.

Training of personnel in precision approach radar was completed at Gander and the radar unit was commissioned in January, 1959. A total of 87 VHF controllers graduated from the Toronto and Winnipeg air traffic control schools and a total of 120 new IFR controllers were licensed.

Air Traffic Control

One new control tower was commissioned at Whitehorse, Y.T. Landings and take-offs controlled by the Department's 28 towers totalled 3,082,203, an increase of 8.6 per cent over the previous year. Of this total, 74.8 per cent were civil and 25.2 per cent were military.

Traffic handled by the Department's eight area control centres also increased. Fix postings totalled 2,697,122, an increase of 25 per cent over the previous year. IFR flight plans totalled 744,900, an increase of 15.1 per cent; and VHF, 226,037, an increase of 2.7 per cent.

Approach control service was operated at Frobisher, Ottawa, North Bay, Winnipeg, Edmonton and Calgary, the latter being added during the year, and the Aircraft Movement Information Service (AMIS) was fully implemented throughout Canada.

Installation of surveillance radar equipment was completed at Quebec, Montreal, Ottawa, North Bay, Winnipeg, Saskatoon, and Vancouver, and Altitude Assignment Apparatus installed at Gander and Winnipeg airports.

Facilities to provide direct pilot-to-controller communication were commissioned at Sydney, N.S., Smiths Falls, Ont., and Calgary, Alta., controlled by the Moncton, Montreal and Edmonton centres, respectively.

Aircraft Accident Investigation

Of the 355 accidents involving Canadian registered aircraft, 76.9 per cent was attributed to personnel error, an increase of 3.9 per cent over the preceding year; material failures decreased by 5.8 per cent; those caused by weather increased by 0.3 per cent; and undetermined causes increased by 1.5 per cent.

Air Carriers

Of the 452 commercial air carrier operating services in Canada, 277 were Canadian and 175 were foreign and Commonwealth.

Aircraft Registration

Registered aircraft totalled 4,547, an increase of 510 over the previous year. The greatest increase was in the private category, a total of 2,513 being registered as compared with 2,091 the previous year.

Airports

During the year the Civil Aviation Branch took over the operation and maintenance of the airports from the R.C.A.F. at Fort Nelson, B.C., and Whitehorse, Y.T., and the airport from Nordair Limited at Fort Chimo, Que. Canadian Marconi undertook the operation of the airport at Knob Lake on behalf of the Department.

Maintenance—Experiments were carried out to determine the best types of equipment and clearance methods needed to keep runways completely free of snow, sand or other loose matter, as is required for operation of the new types of jet aircraft. Considerable success was experienced with the use of very large snow-blowers in tandem with steel-bristle sweepers for winter and just the sweepers in summer. Purchases of new mechanical equipment totalled approximately \$2,000,000, considerably in excess of the amount for the previous fiscal year.

Revenues—Airport revenues totalled \$8,608,150, an increase of \$1,719,264 over the previous year. This was due partially to increased business and partially to higher landing fees which came into effect during the previous year.

Development—Work continued on new airports at Halifax, Riviere du Loup, Sault Ste. Marie, Edmonton, Williams Lake and Prince Rupert, B.C., and Inuvik, N.W.T., and new airports were started at Sherbrooke and St. Joseph d'Alma, Que.

A contract was awarded in November covering excavation and drainage for the new air terminal at Toronto, and plans progressed for new terminal facilities at Sault Ste. Marie, Ont.; Winnipeg; Edmonton; Patricia Bay, Port Hardy and Prince Rupert, B.C.; and Inuvik and Frobisher, N.W.T. A start was made to provide terminal facilities at Abbotsford, B.C. New terminal buildings were completed at Torbay, Nfld., and Windsor, Ont.

Considerable progress was made in the construction of runways, taxiways and parking aprons, and in lengthening and strengthening existing facilities to accommodate the larger and faster types of aircraft. Projects were completed at 25 airports and started at 19.

A major contract was substantially completed at Frobisher for the construction of living quarters, a four-room school, warehouses and an administration building.

Power and Lighting—Construction of airport lighting facilities was in various stages of completion at 19 sites, and work on the establishment of power facilities was carried out at 26 locations.

Radio and Television

Radio stations in operation totalled approximately 57,000, an increase of 2,000 over last year. Included are those operated by federal, provincial and municipal governments; ships and aircraft; and public and private land mobile services.

Ten private commercial broadcasting stations (television) commenced operation during the year, five of which were rebroadcasting stations using "off-the-air" pickup.

Interference Suppression

During the year, 18,315 sources of interference were located and suppressed in all but a few cases which had no economic cure. This total is 58 per cent higher than the previous year, the increase being caused entirely by power lines in poor condition.

Interference caused by television receivers has rapidly declined as a result of modifications made by manufacturers. During the past year there were only 10 cases of interference from this source as compared with an annual 400 to 500 a few years ago.

New equipment for interference investigation has been installed in a number of departmental cars.

Monitoring Stations

Progress was made with the construction of the mobile monitoring station, using a tractor-trailer. This unit will make possible the investigation of frequencies which cannot be monitored by stations in fixed locations.

Emphasis on spectrum policing was continued and reports from the monitoring stations continued to show the necessity for better frequency utilization by many licensees. These reports are used as a basis for conducting an educational program wherever necessary so that proper station operating techniques will contribute to spectrum conservation.

Many unlicensed radio stations were detected by the monitoring service and enforcement action was taken to have these stations either properly licensed or closed down. In most instances the equipment used by these stations consisted of low-powered portable units.

The relocation of the Winnipeg monitoring station to Lakehead, Ont., was completed during the latter part of the year and the Winnipeg station closed. A site was selected at Montague, P.E.I., for the relocation of the Hartlen Point, N.S., monitoring station.

Radio Aids to Navigation

Seven of the stations in the Yukon and Northwest Territories radio system, operated by the Royal Canadian Signal Corps, were transferred to this Department for operation, and plans are underway for taking over 12 more during the next year.

During the year evaluation tests of the four Decca chains established on the East Coast were completed and arrangements were made to continue operations by contract, pending a final decision as to whether the installations should be purchased and operated by the Department as a permanent aid to marine navigation. Evaluation tests of Dectra as a trans-Atlantic air navigation aid continued.

Long range surveillance radar systems were commissioned as an aid to air traffic control at Montreal, Toronto, Winnipeg, and Saskatoon, and installations at Moncton, Quebec, North Bay, Calgary, and Vancouver were completed, with testing in progress. Installations at Kenora and Regina are nearing completion and similar facilities are planned for Halifax, Lakehead and Edmonton.

A Ground Control Approach (GCA) unit was commissioned at Gander, Nfld. This installation consists of a surveillance radar with a range of about 50 miles and a precision approach radar.

Instrument Landing Systems (ILS) were commissioned at Gander, Nfld., and Fredericton, N.B., and construction progressed at Fort St. John. One system was relocated at Winnipeg and a relocation at Lethbridge is in progress.

Very High Frequency Omni ranges (VOR) were commissioned at Kenora, Ont., and Regina, Sask., and progress was made in providing this facility across Canada. There are now 11 in operation, 17 under construction or undergoing test, and 7 for which sites have been selected.

New aeronautical radiobeacon facilities were provided at Gander, Nfld.; Val d'Or, Que.; Ash, Powassan and Sturgeon Falls, Ont.; Lac la Biche, Alta.; and Campbell River, B.C.

A combined communication and radio beacon station was established at Roberval, P.Q., by Nordair Ltd., for operation under contract on behalf of the Department.

The direction finding service at Churchill was replaced by a radiobeacon, and the aeradio marine station was completed.

An aeradio marine station was also established at Tofino, B.C., by combining existing aeradio facilities with Pachena marine radio facilities.

Radio Inspections and Examinations

During the year 19,439 radio stations of all classes were inspected, including 161 surveys of Canadian and foreign ships.

A total of 5,797 certificates of proficiency in radio were issued from 5,051 examinations held.

Telecommunications Revenue

Revenue from all sources totalled \$2,111,953.77, and in addition \$470,247.76 was collected for the Canadian Broadcasting Corporation from private commercial broadcasting licences issued.

Government Telegraph and Telephone Service

Thirteen of the fifteen remaining Government telegraph offices in Cape Breton were closed, as adequate telephone service is now available in the areas concerned. The remaining telephone office at Little Narrows was also closed and the lines connected to the Maritime Telegraph and Telephone Company's exchange at Whycocomagh.

In New Brunswick, lines in the Chatham, Escuminac and Richibucto areas were acquired by the New Brunswick Telephone Company.

In the Magdalen Islands, work proceeded on the installation of a dial telephone system and materials were ordered to increase the trunking facilities between Grindstone and the mainland.

In Ontario, the Cockburn Island telephone lines were sold to the Township of Cockburn Island.

Northwest Communications System

Effective April, 1958, this system was entrusted to the Canadian National Railways.

Meteorological Services

The 59 forecast offices issued forecasts four times daily for 77 inland regions and 23 Canadian cities, and three times daily for 40 marine areas. In addition, specially prepared forecast advice was supplied to agricultural, forestry, industrial and government interests.

In Toronto and Montreal, automatic telephone weather announcement services were introduced.

A local weather office was opened at Prince Albert, Sask., and arrangements were made for the establishment of a similar office in London, Ont.

The principal aviation forecast offices issued by teletype more than 80,000 regional forecasts, 11,000 high-level wind forecasts and 175,000 terminal forecasts. In addition, the other forecast offices issued on a regional basis more than 11,000 regional and 80,000 terminal forecasts.

The introduction of jet airliners into scheduled trans-Atlantic service in October, 1958, and of turbo-prop aircraft in trans-Pacific service in the summer of 1958, increased demands for weather service. To cope with the increased work-load, the preparation of forecasts up to 30,000 feet for trans-Atlantic flights was consolidated at Montreal, leaving to Gander the preparation of forecasts above 30,000 feet for jet operations through and over Gander.

The Vancouver Meteorological Office was required to supply forecasts up to heights of 30,000 feet for trans-Pacific flights, about 12,000 feet higher than before, and the western coverage of forecasts was extended from Western Alaska to Tokyo.

The aviation forecast office at Claresholm R.C.A.F. Station closed, and the Department took over the Fort Nelson aviation forecast office from the R.C.A.F. and H.M.C.S. *Labrador* from the R.C.N.

New plastic display panels were designed and built for the Malton briefing office to portray forecast flight conditions in pictorial form. Field tests of the two briefing consoles used to display meteorological information at small stations, such as areadio or meteorological observing stations, proved successful and arrangements were made to purchase a slightly revised version in quantity.

Favourable reaction to demonstration trials of closed circuit TV for air crew meteorological briefing indicates that such installations might prove valuable at a number of locations.

A Decca 41 weather radar was put in operation at Vancouver Airport and another set purchased for installation at Gander.

In October, 1958, special wind-finding equipment known as the Decca Radar Windfinder was installed at Port Hardy for operation on a trial basis. The operation of this equipment proved quite successful in measuring upper winds to higher altitudes than was possible with the regular equipment.

"MET" Communications

The meteorological teletype system underwent further expansion by 9,300 miles, making a total of 48,400 miles of circuit, and the Halifax Ice Central Office was added to the weatherfax system which now totals 13,300 airline miles of circuit.

Hydrometeorology

The new Hydrometeorology Section was established during the year. It is concerned with applying climatology and meteorology to the solution of Canada's flood, drought and water supply problems.

Ice Observing and Forecasting

The Meteorological Branch assumed full responsibility for ice observing from the air, and organized a sea-ice forecasting service for shipping in the Gulf of St. Lawrence, Cabot Strait, the Newfoundland Coast and Strait of Belle Isle. Northern forecast offices were operated at Churchill, Frobisher and Cambridge Bay, providing an advisory service and forecasts of ice conditions for shipping in Arctic areas and the Churchill route. An Ice Central, established with the co-operation of the Royal Canadian Navy at Shearwater, N.S., provided short and long range ice forecasts for a wide area. This office will be taken over by the Meteorological Branch in the fall of 1959 as a central agency for all information on ice in Canadian waters. During the year, more than a quarter of a million reconnaissance miles were flown, logging over 1500 hours' ice observing time.

Special Projects

The observational research program for the International Geophysical Year was completed on December 31, 1958, with observations from all upper-air stations, key synoptic surface stations, radiation and ozone stations being transmitted to the World Meteorological Organization data collection centre at Geneva. Several of the upper-air stations continued special observations, especially for radioactive fall-out data. Upper-air stations in the Churchill area supplied information for the U.S. Signal Corps IGY rocket firing program.

In collaboration with the Department of Agriculture, the Ontario Research Foundation, and some commercial organizations, field work was undertaken in the tobacco area of Norfolk County, Ontario, to study the meteorological conditions associated with weather flecking of tobacco leaves. It is planned to expand this program during the summer of 1959.

The latest type automatic tracking radiotheodolite and a complete automatic weather observing station were delivered to the instrument field testing station established on the premises formerly occupied by the National Research Council Radio Propagation Laboratory at Scarborough Bluffs, Ont. Testing of these units will begin in the summer of 1959.

Instrument Production

A total of 1,653 shipments of instruments and components was an all-time high and an increase of 8 per cent over the previous year.



Canal lock gates being dismantled for Seaway flooding.

Navigation

CANAL SERVICES

Studies were made and experimental work continued to find the most effective method of combatting ice formation to prolong navigation at the end of the season. On the Lachine and Soulanges canals, compressed air was used extensively to clear ice from the lockgate recesses during the period from November 29 to the close of navigation on December 16 when ice formation delayed a number of vessels. On the Welland canal some minor delays were caused by ice formation late in November. There was no difficulty on the Sault Ste. Marie canal where compressed air jets kept the lock sufficiently clear of ice.

Traffic and Freight

Freight tonnage passing through the various main line canals decreased slightly in 1958, but remained about 100 per cent higher than ten years previously. Of the total traffic, approximately 89.1 per cent was carried by vessels of Canadian registry.

Canal	Freight (Tons)		Decrease Per cent
	1958	1957	
Sault Ste. Marie	1,228,661	1,784,700	31.2
Welland Ship	21,274,194	22,372,538	4.9
Cornwall	11,762,100	12,191,492	3.5

(A comprehensive report prepared by the Public Finance and Transportation Division of the Dominion Bureau of Statistics in collaboration with the Canals

Branch, giving a detailed analysis of freight and vessel movements throughout the various canal systems, is obtainable from the Dominion Bureau of Statistics, Department of Trade and Commerce, Ottawa.)

Foreign Vessels

In 1958 the number of foreign vessels engaged in the lake trade and passing through the Welland canal increased to 187 from 133 the previous year, and the number of trips during the season amounted to 534 as compared with 351 in 1957.

Hydraulics

The flow of water through the canals is regulated by means of dams and weirs to prevent flooding and to maintain water supplies in natural reservoirs.

Storage water was distributed throughout the year as required for navigation, power generation, municipal supply and other interests concerned. A considerable quantity of water is leased for power development on the Welland canal, Trent canal and the Rideau.

Construction and Engineering

Engineering studies and investigations, involving field surveys and preparation of plans and specifications, were carried out for continuing improvements.

Construction continued on a new bascule bridge over the Lachine canal at Ville St. Pierre, Que.

St. Lawrence Seaway and Power Project

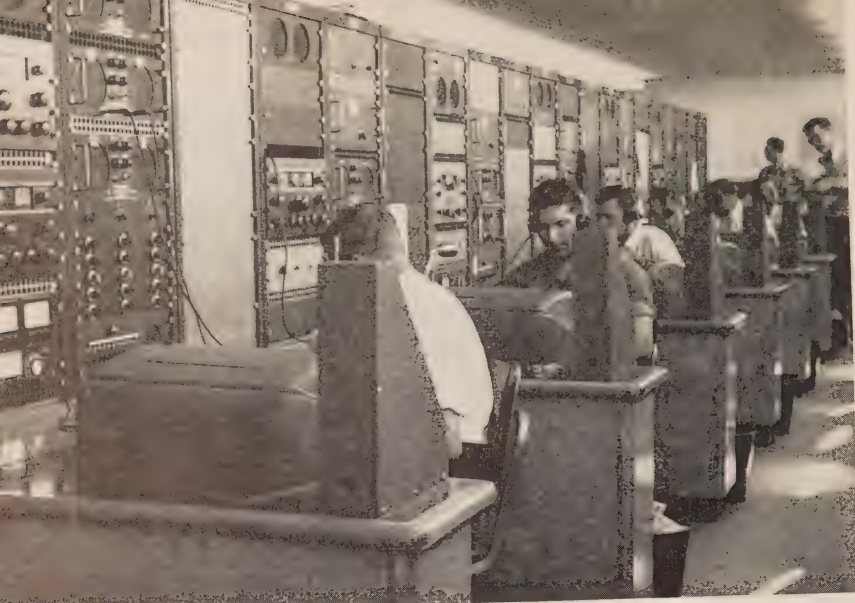
Plans made in close co-operation with the Ontario Hydro for dismantling and removing lock equipment and buildings prior to flooding the international power head pond at Cornwall were carried out successfully and on July 1 the Farrans Point, Rapide Plat and Galops canals, and part of the Cornwall canal ceased to exist, and traffic was routed through the new Seaway canal.



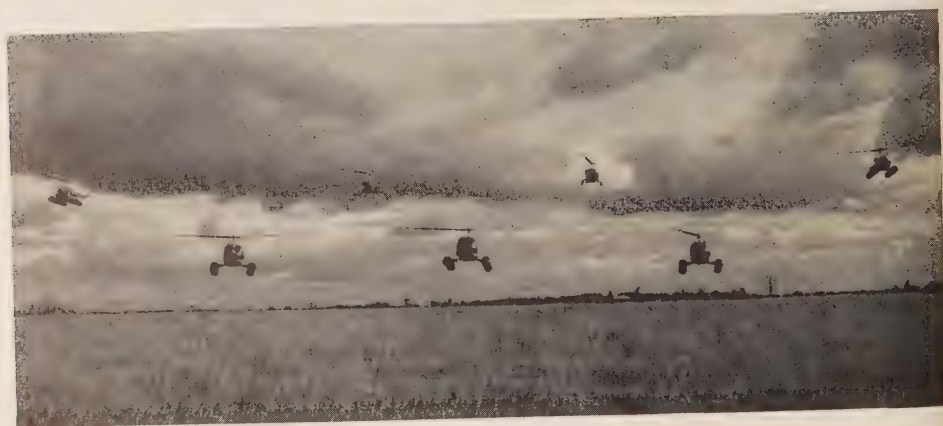
New *Sambro* Lightship, Halifax.



Old Cornwall Canal buildings razed before Seaway flooding.



Aeradio message
centre at Gand
International A
Nfld.



D.O.T. helicopter fleet.



Airways inspe
calibrate navi
facilities

traffic control
ander, Nfld.



Airport construction, Frobisher Bay.





Department steamship inspector at work.



D.O.T. barges carry freight ashore at Resolute, Cornwallis Island.



C. D. Howe unloads supplies at Resolute for Arctic weather stations.

Construction

MARINE SERVICES

Major light and fog alarm stations were completed and placed in service at Keppel Island, Nfld., and Cap Bon Desir, Que. Preliminary investigations were carried out at Bonilla Island and Cape Scott, B.C., in connection with plans for new stations at these two points. Initial plans were also made for the relocation and rebuilding of the main light and fog alarm station at Camp Island, Labrador.

Five major light towers and fog alarm buildings, and 26 new lightstation dwellings were constructed under the supervision of engineers of the Aids to Navigation Division.

Work continued on plans for a concrete pier lighthouse to replace Prince Shoal Lightship No. 20 in the St. Lawrence River.

The new system of aids to navigation for the St. Lawrence Seaway neared completion in readiness for the Seaway opening.

The District Marine Agency at Fort Smith, N.W.T., moved into new offices and received two specially designed shallow draft work boats to carry out the expanded program of navigational aids in the waterways of the Northwest Territories.

An office and stores building for the Halifax Agency is nearing completion and plans are proceeding for new facilities at Saint John, N.B., Charlottetown, P.E.I., and St. John's, Nfld.

Research

The new transistor-type flasher and sun valve, recently developed by the National Research Council, have proven very satisfactory and both items are now being used extensively in the field.

After considerable testing and research, the National Research Council was successful in locating the source of interference to the micro-wave control system at Pelee Passage and the trouble has now been eliminated.

Harbour Commissions

With the incorporation of the Lakehead Harbour Commission at Port Arthur and Fort William, there are now nine active Harbour Commissions.

Revenue

Harbour dues collected totalled \$191,426, an increase of \$32,416 over the previous year. Wharfage collections amounted to \$763,292, an increase of \$19,147 over the preceding year, and revenue from water lots and land leases totalled \$33,667.

Vessel Registration

During 1958, 1,020 vessels were added to the Canadian registry and 510 removed, making a net increase of 510 and a total of 18,797 vessels of 2,382,983 gross tons at the end of December, 1958.

In the same period, 52,595 small vessels exempt from registry were licensed under the Small Vessel Regulations, making a total of 251,553 such licences issued throughout Canada.

Pilotage

During the fiscal year, 352 licensed pilots in the nine pilotage districts performed 38,983 pilotages and 9,974 movages, grossing \$3,974,650 in pilotage fees.

Masters, Mates and Seamen

Examinations totalled 939, resulting in 542 Masters, 75 First Mates and 94 Second Mates certificates being issued.

Navigation Schools

Navigation schools were fully maintained by the Department at Quebec, P.Q., and Prince Rupert, B.C., and financial support provided navigation schools under local education authorities at Halifax, Montreal, and Vancouver.

Marine Casualties

Ten preliminary inquiries into marine casualties were held. The formal investigation of the stranding of the C.G.S. *Baffin* off the coast of Nova Scotia ended in November, 1958.

Ship Maintenance

Costs for repairs and maintenance carried out on thirty of the Department's ships totalled \$1,559,233.

Ship Construction

The construction of two shallow draft vessels for service in the Northwest Territories, a pilot boat for service at Saint John, N.B., and the conversion of the C.G.S. *Labrador* from naval to civilian operation was completed during the year.

Thirteen ships are being built: three icebreaker, supply and buoy vessels—two for the east coast and northern waters, and one for the west coast and western Arctic; six supply and buoy vessels—three for the east coast, and one each for the Sorel Marine Agency, the west coast, and the Great Lakes; a triple screw icebreaker for service at Quebec and in northern waters; a lightship for the Quebec Marine Agency; a sounding vessel and a supply vessel for the St. Lawrence Ship Channel.

Construction began on automobile and passenger ferries for Pelee Island, Ont., and Bell Island, Nfld.

Design plans are under way for three passenger and cargo vessels for Newfoundland coastal service, Labrador coastal service, and the West Indies, respectively.

Northern Transportation

Northern transportation operations began on June 13 when the C.G.S. *Ernest Lapointe* sailed for Goose Bay with 40 tons of general cargo, placing buoys and other aids to navigation in position. The C.G.S. *C.D. Howe* and *N.B. McLean* followed on June 28, sailing from Montreal with 1,027 and 713 tons of cargo, respectively. The *McLean* also carried out ice patrol duties before proceeding to assist the convoy bound for Resolute Bay. She returned to Quebec on November 9. The C.G.S. *Labrador* began her first voyage on July 14, sailing from Montreal with supplies for the R.C.M.P. detachment at Alexandra Fjord. She returned to Quebec on October 1.

Operation *Nors 58* commenced with the sailing of the *d'Iberville* from Montreal on July 23 with 194 tons of oil and general supplies. Forming convoy with the S.S. *Brazilian Prince* and M.V. *Sea Transporter* at Quebec on July 29, she proceeded to Resolute Bay and Eureka, returning to Quebec on September 21.

The C.G.S. *Edward Cornwallis* and *Montcalm* sailed for the North from Montreal on July 10. The *Cornwallis*, carrying 751 tons of cargo for points in the Hudson Bay and Strait, also carried out ice patrol work during the season, returning to Halifax on September 3. The *Montcalm* carried 245 tons of cargo for points in Foxe Basin and performed icebreaking duties in that area, returning to Quebec on November 3.

The *Ernest Lapointe* left Quebec on July 18 for Frobisher Bay and ports in the Hudson Strait to service aids to navigation in that area. On August 30 she proceeded to Godthab, Greenland, to carry out a special assignment for the

Department of Northern Affairs, returning to Quebec on September 26. Early in November, with 30 tons of winter supplies, she made another trip to Goose Bay to place winter buoys and close the port for the season.

In addition to the Government vessels, 22 commercial ships carried approximately 77,000 tons of cargo to various stations in the North. More than 300 passengers were transported between ports of call by all vessels, and all assignments were carried out successfully.

Aerial Ice Survey

The annual spring aerial investigation of ice conditions in the River and Gulf of St. Lawrence and on the east coast was again carried out in co-operation with the International Ice Patrol.

The Department also sponsored aerial ice surveys over the Hudson Bay and Strait and the west coast of Ungava Bay for the fourth year, over the Strait of Belle Isle for the third year, and over the St. Lawrence River from Quebec City to Anticosti Island for the second year.

St. Lawrence Ship Channel

Apart from carrying out normal ship channel assignments, much of the year's work was devoted to assisting in completing the Seaway in time for the opening of navigation in 1959. Work for the National Harbours Board included surveys in the Saguenay River, four miles east of Chicoutimi, to determine the most practical anchorage location for the discharging of lake-size tankers. Dredging operations in Montreal Harbour continued under the supervision of Ship Channel engineers, and maintenance surveys and sweeping were conducted in the St. Charles River and Wolfe's Cove in Quebec and at the deep-water berths at Three Rivers.

Icebreaking

An early winter placed an extremely heavy work-load on the Department's icebreakers, *d'Iberville*, *N.B. McLean*, *Ernest Lapointe* and *Montcalm*, operating in the Montreal area. The last inbound ship arrived at Montreal on December 10, and outbound sailings had been scheduled up to December 17, the average last sailing date for the previous years. However, unseasonably cold weather set in during the last week of November and by December 10 the ships leaving Montreal began having difficulty at the foot of Lake St. Peter where the ice had rafted to a depth of several feet. Two days later eleven ships were held fast by ice at Lanoraie. By December 18, they were freed by icebreakers and convoyed to Three Rivers, sailing the following day without difficulty.

Icebreakers then proceeded to Montreal Harbour where twenty ships were trapped. In two days they opened the channel as far as Montreal East and escorted five ships to Three Rivers, the last arriving on December 23. Before proceeding to the relief of the remaining ships, the icebreakers were required to break up a jam that was rapidly causing the water levels to rise to the flooding stage.

By January 14 all vessels had cleared the river safely with the exception of one coastal trader which decided to winter in port. Altogether forty-three ships, inbound and outbound, were assisted from the beginning of severe ice conditions to the sailing of the last convoy from Montreal.

The first arrival of the 1959 season from overseas was the S.S. *Volumnia* on April 1.

Steamship Inspection

New ships constructed under the inspection of the Department totalled 34, and 26 ships were converted or reconditioned. Inspections of ship's tackle numbered 3,920, compared with 3,730 the previous year and 222 cases required repair, adjustment or testing of cargo-handling gear in the interests of safety.

Regulations

To enforce Oil Pollution Regulations, inspections were conducted during the shipping season by peace officers and Steamship and Tackle Inspectors. A motor-boat patrol operated in the St. Lawrence River between Montreal and Three Rivers. The first prosecution under the new regulations resulted in a conviction for the ship's master.

Dangerous Goods Shipping Regulations were completely revised to cope with the expansion of the chemical and explosives industries.

"Safety Afloat"

Nation-wide interest in the safe operation of small boats was indicated by demands from the public for the Department's publication, "Safety Afloat". During the 1958 boating season, 240,000 copies in English and 20,000 French were distributed.

Nuclear Power Committees

A nuclear power committee was set up within the Department to study developments in, and the feasibility of, the use of nuclear power for ship propulsion, and personnel from the Steamship Inspection Service have been selected for an extensive course in nuclear engineering.

A marine nuclear power safety committee is being formed with representatives from other government departments to consider procedure to be followed when nuclear-powered vessels, under any flag, enter Canadian waters. This committee is working in co-operation with similar groups in the United Kingdom and the United States and their findings will constitute part of the deliberations at the inter-government maritime consultative organization meeting being held in 1960.

Marine Engineer Training

The Department's marine engineer training scheme completed its third year, with the trainees taking courses leading towards qualification as a professional

engineer by election to a professional engineers association (provincial). All trainees passed the final examination of the evening class courses and during July took additional courses in Toronto.

Five bilingual trainees were recruited to form the second group and were assigned to shipyards at Montreal and Lauzon, Que.

Engineer Examinations

Of the 1,015 candidates for certificates of competency as marine engineers, 838 were successful, 34 obtaining a partial pass.

RAILWAY SERVICES

Canadian National Railways

The Canadian National Railways operated at a deficit of \$51,591,424, compared with a deficit of \$29,572,541 in 1957.

Canadian National (West Indies) Steamships Limited

This service was discontinued in July, 1957, as a result of a strike called by the Seafarers International Union. Prolonged negotiations failing to effect a settlement, the fleet of eight vessels was sold in August, 1958.

Prince Edward Island Ferry and Terminals

The operation deficit for this service amounted to \$1,987,689, compared with a deficit of \$2,027,639 in 1957.

Highway traffic to and from Prince Edward Island continues to increase. In 1958 some 144,381 vehicles were handled, an increase of 4,109, or approximately 3 per cent, over the previous year.

Cabot Strait Ferry Service

The M.V. *William Carson* commenced scheduled operations between North Sydney and Port aux Basques on October 6, 1958. In addition, a freight service only was operated throughout the year between North Sydney and various other ports in Newfoundland as required.

Docks and Terminals

Expenditures for additions and betterments to the new terminal facilities at North Sydney amounted to \$43,815, making a total expenditure of \$3,620,998 on the new facilities and equipment at March 31, 1959. At Port aux Basques, expenditures for additions and improvements to the new terminal facilities amounted to \$92,026. Total expenditures to March 31, 1959, amounted to \$6,244,356.

Yarmouth, N.S.-Bar Harbor, Me., Ferry Service

Passengers carried totalled 88,006 as compared with 96,626 the previous year, and vehicles totalled 29,265, a decrease of 1,505. The service operated at a deficit of \$203,345 as compared with \$278,094 the previous year.

Transo Causeway

Construction expenditures on the causeway amounted to \$38,337, bringing the total construction cost to \$20,137,241. In addition, \$9,988 was spent to repair damage caused by a hurricane.

Railway Subsidies

Subsidies totalling \$1,100,000 were paid to the Canadian National Railways on the construction of the Beattyville-Chibougamau Branch line. Total subsidies paid towards this project at March 31, 1959, amounted to \$6,325,000 for 253 miles of completed line. The estimated total length of this branch line is approximately 295 miles and the remaining section, between St. Felicien and Cache Lake, is expected to be in operation late in 1959.

FINANCIAL SUMMARY

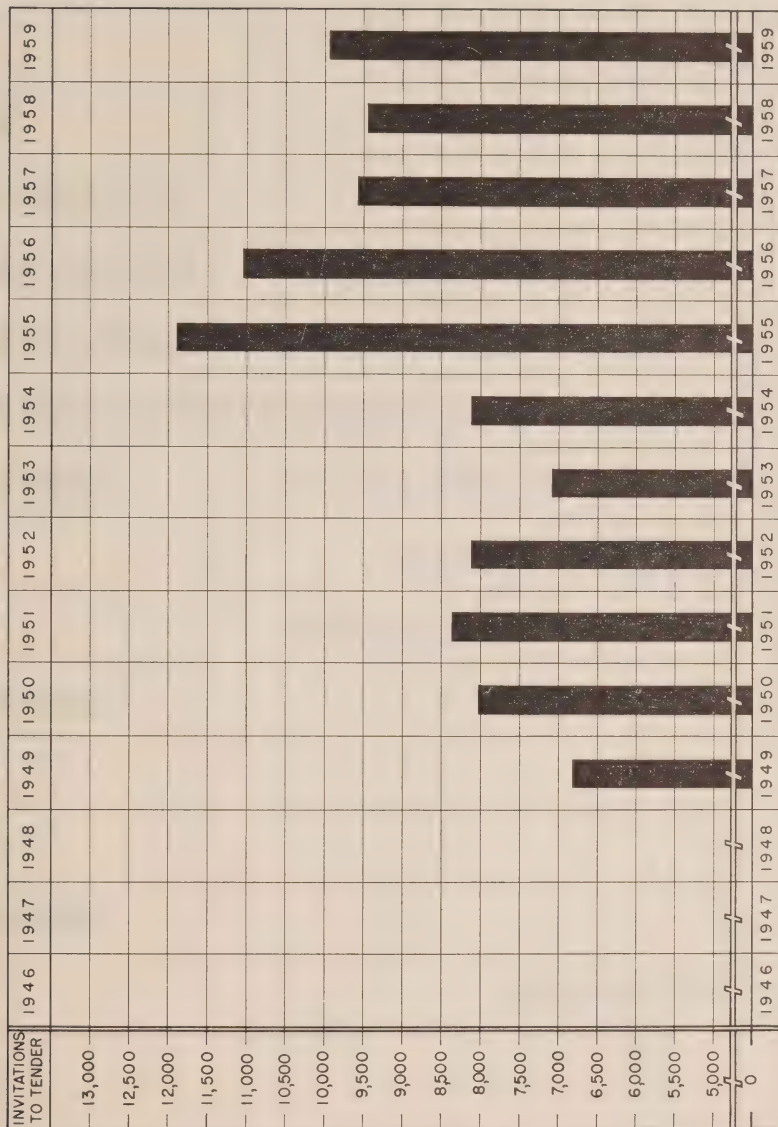
Total expenditures during the year amounted to approximately \$290,000,000 including about \$11,400,000 from funds provided by the Department of National Defence and other government departments. The total expenditure was approximately \$82,000,000 higher than the previous year, due mainly to increased expenditures for construction work at airports, ship building and the operating deficit for the Canadian National Railways.

Revenues from all services totalled approximately \$16,800,000, compared with about \$13,300,000 for the previous year. Air Services revenues were up by approximately \$1,800,000, due mainly to increased revenues from aircraft landing fees, rentals, radio services and concessions at major airports. The Marine Services revenues were up by approximately \$1,000,000, due mainly to increased revenue from steamers' earnings.

Summary of Expenditures and Revenues Fiscal Year 1958-59

	Expenditures	Revenues
Departmental Administration	2,411,232.90	7,186.46
Air Services	115,449,689.67	11,102,785.88
Canal Services	9,725,774.68	1,654,014.19
Marine Services	51,801,483.64	2,231,702.90
Railway and Steamship Services	75,739,245.47	1,824,101.33
Miscellaneous Services	23,512,854.00	2,117.70
Total—Departmental expenditures and revenues	278,640,280.36	16,821,908.46
Expenditures made by Department of Transport from funds provided by other departments or agencies	11,364,892.02	.....
GRAND TOTAL	290,005,172.38	16,821,908.46

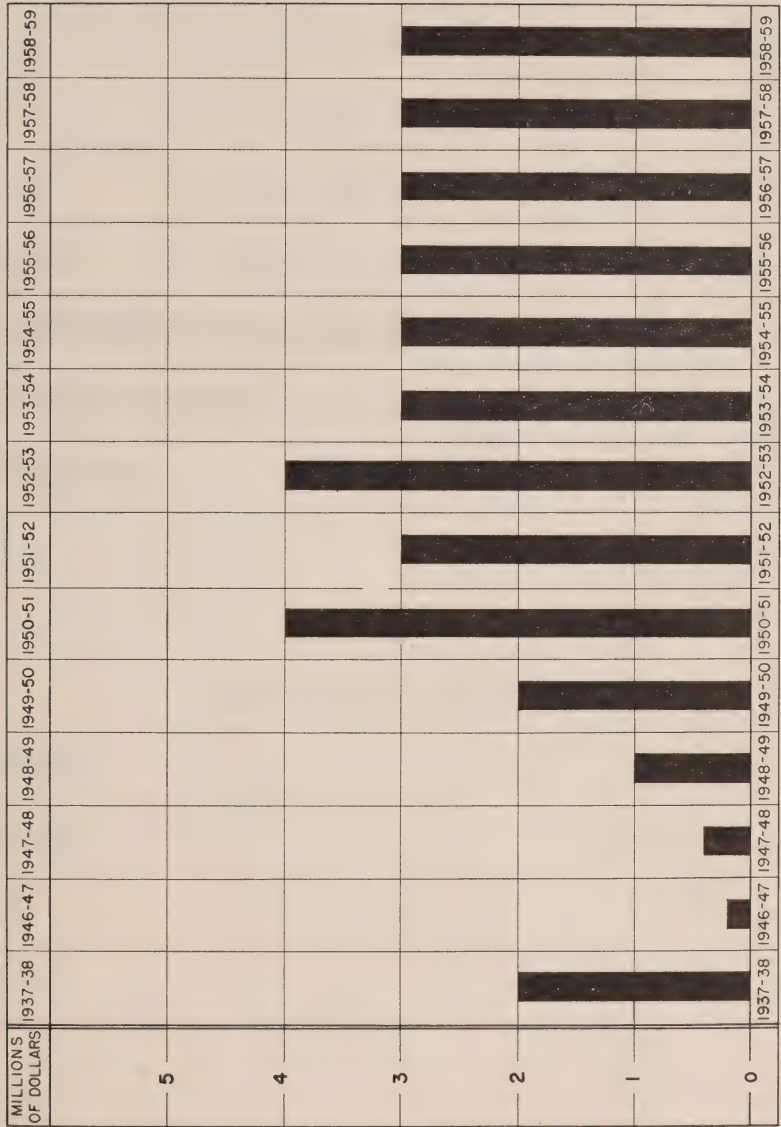
NO. OF INVITATIONS TO TENDER DURING YEAR ENDING MARCH 31ST.



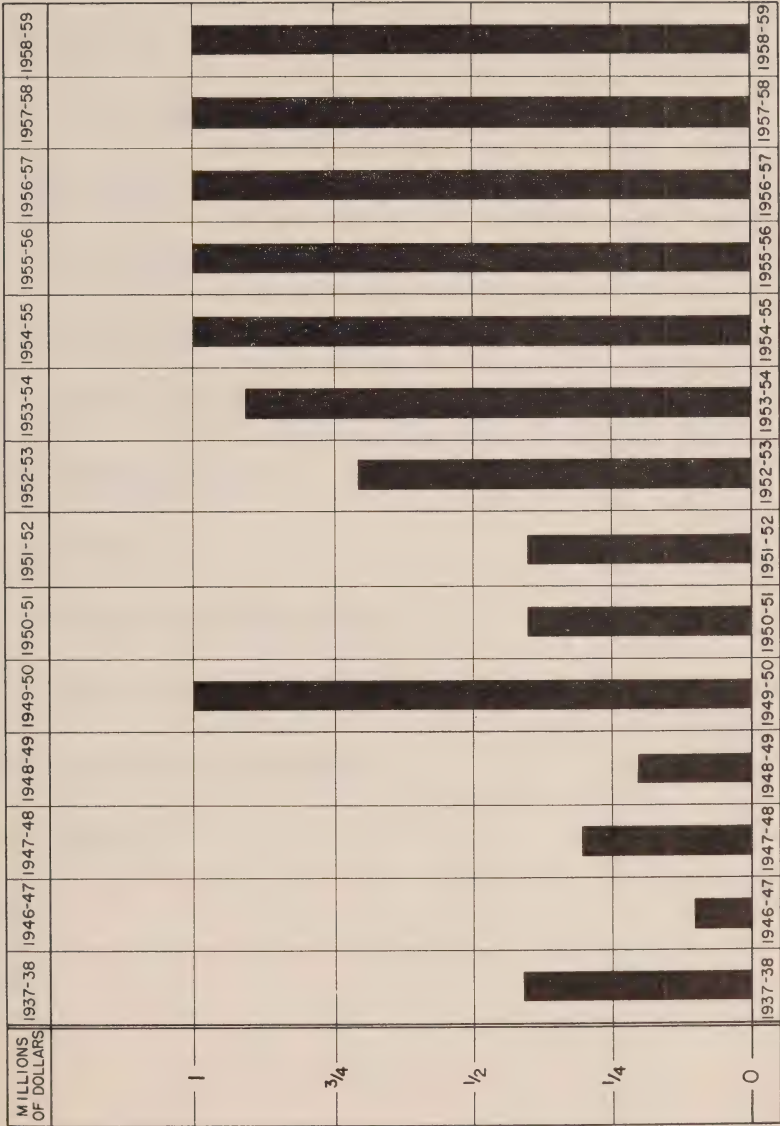
DEPARTMENT OF TRANSPORT

CONSTRUCTION OR ACQUISITION OF BUILDINGS, WORKS, LAND AND NEW EQUIPMENT

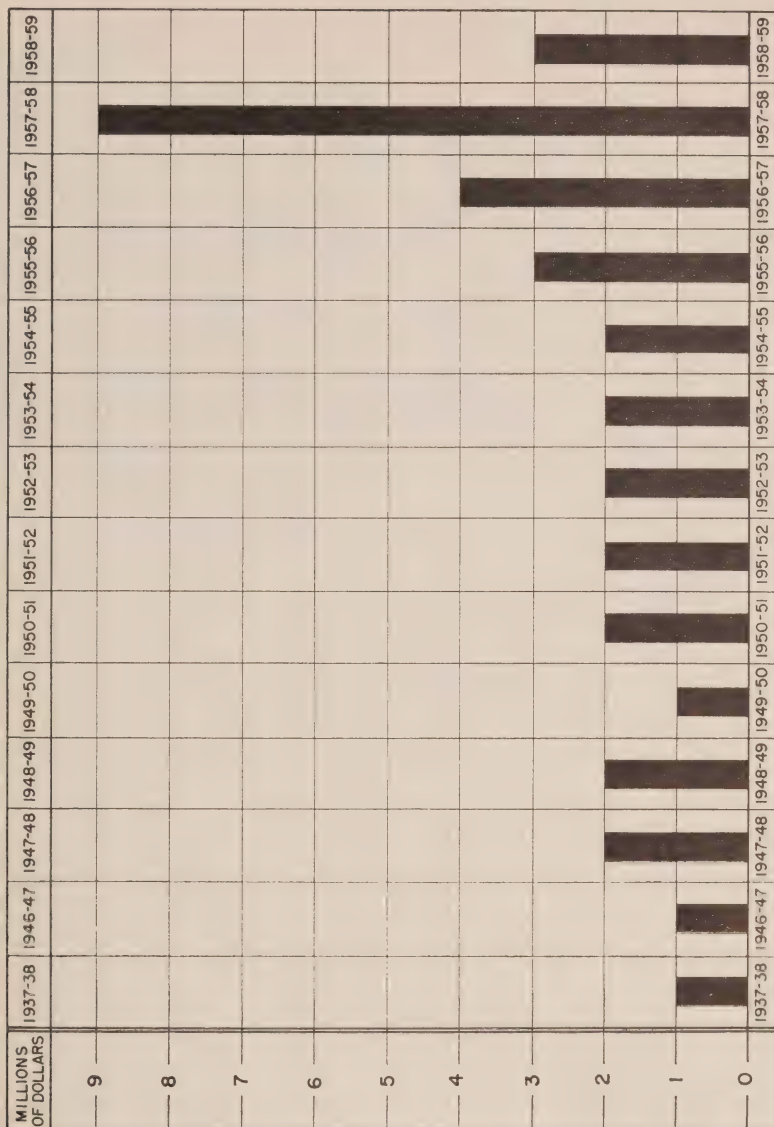
CANALS

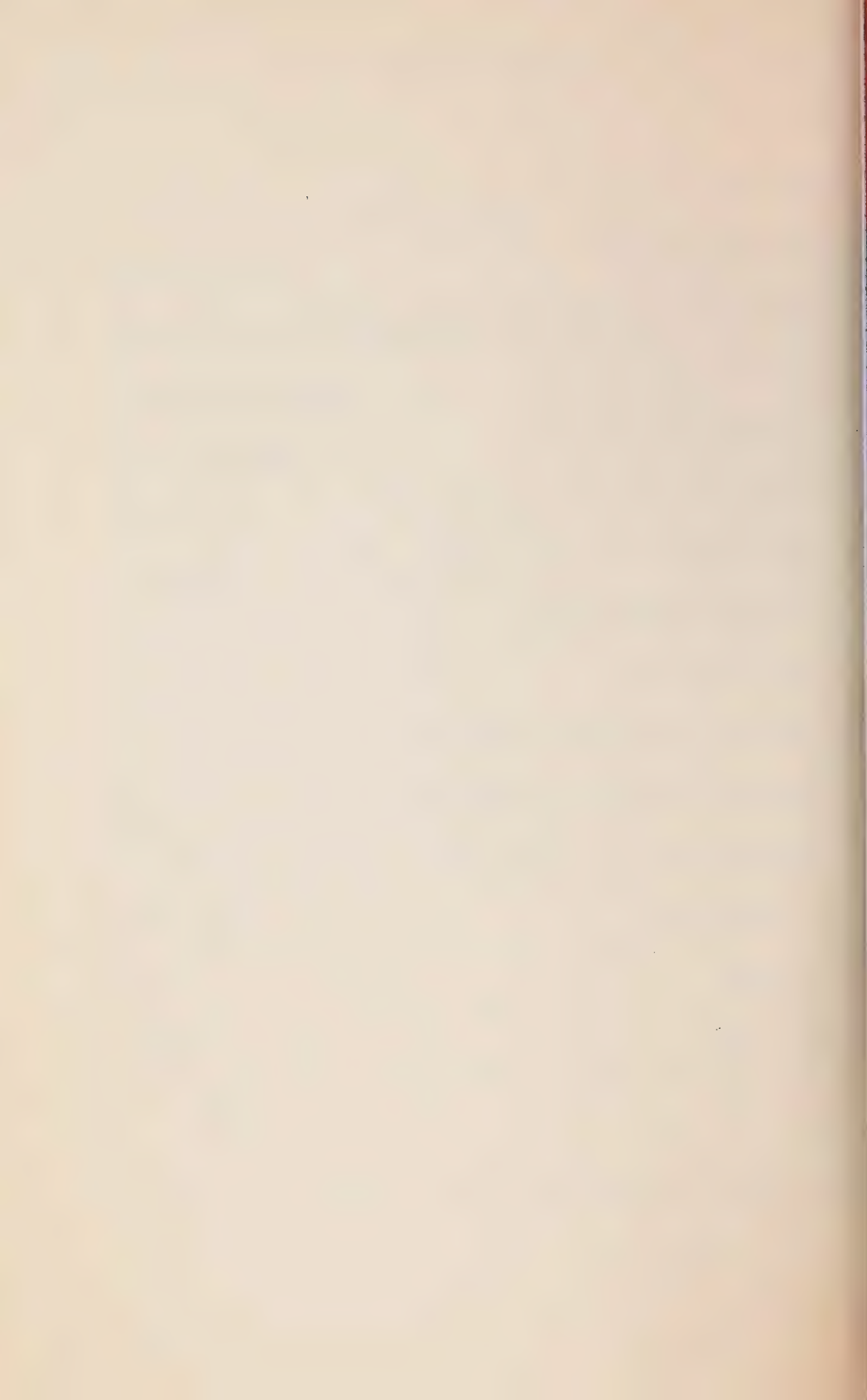


DEPARTMENT OF TRANSPORT
CONSTRUCTION OR ACQUISITION OF BUILDINGS, WORKS, LAND AND NEW EQUIPMENT
METEOROLOGICAL



RADIO AIDS TO AIR AND MARINE NAVIGATION





annual report

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FISCAL YEAR ENDED MARCH 31, 1960



DEPARTMENT OF TRANSPORT

OTTAWA, CANADA

ANNUAL REPORT
Department of Transport



CANADA

DEPARTMENT OF TRANSPORT

(ANNUAL) REPORT

FOR THE FISCAL YEAR ENDED

MARCH 31

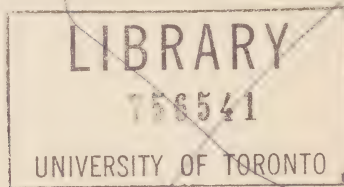
1960

Submitted Under the Provisions of the
DEPARTMENT OF TRANSPORT ACT

ROGER DUHAMEL, F.R.S.C.
QUEEN'S PRINTER AND CONTROLLER OF STATIONERY
OTTAWA, 1961

COVER PHOTO:

The Shape of Flight—of polished sheet aluminum, executed by Canadian sculptor Louis Archambault for the Ottawa Airport.



Price 50 cents Cat. No. T1-3/1960

Available from the Queen's Printer
Ottawa, Canada

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*To His Excellency Major-General Georges P. Vanier, D.S.O., M.C., C.D.,
Governor General and Commander-in-Chief of Canada.*

MAY IT PLEASE YOUR EXCELLENCY:

The undersigned has the honour to present to Your Excellency the Annual Report of the Department of Transport, for the fiscal year ended March 31, 1960.

LEON BALCER, Q.C.,
Minister of Transport.

MINISTRY OF TRANSPORT

MINISTER

BOARDS, COMMISSIONS AND GOVERNMENT-OWNED COMPANIES

Air Transport Board
Board of Transport Commissioners
Canadian Maritime Commission
Canadian National Railways
Canadian National (West Indies) S.S. Co.
Canadian Government Merchant Marine, Ltd.
Canadian Overseas Telecommunication Corporation
National Harbours Board
St. Lawrence Seaway Authority
Steamship Inspection Board
Trans-Canada Air Lines

ACTS ADMINISTERED BY THE DEPARTMENT OF TRANSPORT

GENERAL

Bills of Lading Act
Canadian Overseas Telecommunication Corporation Act
Department of Transport Act
Pipelines Act
St. Lawrence Seaway Authority Act
Telegraph Act
Transport Act

AIR SERVICES

Aeronautics Act
Carriage of Goods by Air Act
Foreign Aircraft Third Party Damage
Radio Act

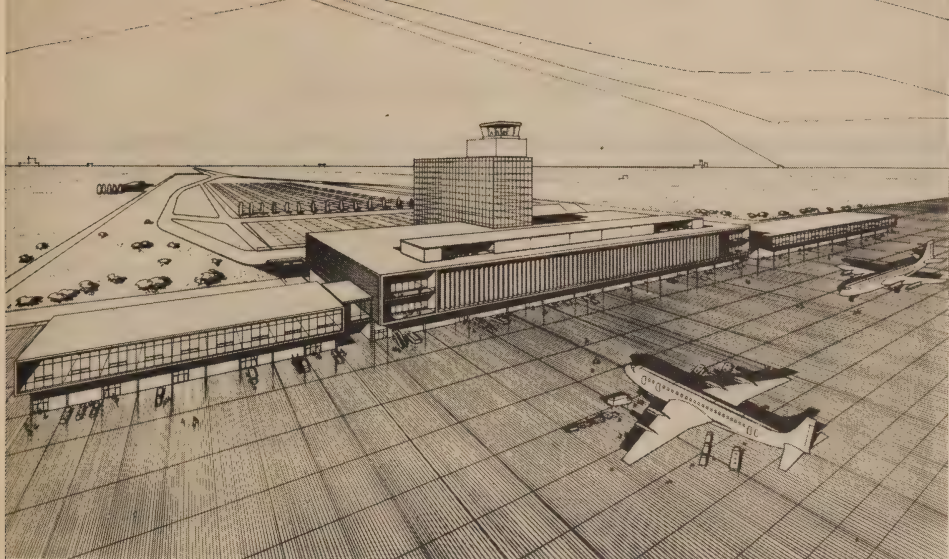
MARINE

Belleville Harbour Commissioners Act
Canada Shipping Act
Canadian Maritime Commission Act
Canadian National Steamships Act
Government Harbours and Piers Act
Government Vessels Discipline Act
Hamilton Harbour Commissioners Act
Lakehead Harbour Commissioners Act
Live Stock Shipping
Nanaimo Harbour Commissioners Act
National Harbours Board Act

Navigable Waters' Protection Act
New Westminster Harbour Commissioners Act
North Fraser Harbour Commissioners Act
Oshawa Harbour Commissioners Act
Port Alberni Harbour Commissioners Act
Toronto Harbour Commissioners Act
Water Carriage of Goods Act
Windsor Harbour Commissioners Act
Winnipeg and St. Boniface Harbour Commissioners Act

RAILWAYS

Canadian National Railways Act
Canadian National-Canadian Pacific Act
Canadian National Railways Financing and Guarantee Act
Canadian National Montreal Terminals Act
Canadian National Railways Pensions Act
Canadian National Toronto Terminals Act
Government Railways Act
Intercolonial Railway and P.E.I. Railway Employees Provident Fund Act
Maritime Freight Rates Act
Railway Act



Architect's sketch of the Edmonton International Airport terminal building presently under construction.

AIR SERVICES

General

The inauguration of heavy jet aircraft operations during the fiscal year 1959-60 gave further impetus to aviation activities throughout Canada. As a result of earlier plans for this development, the essential facilities for the preliminary schedules of jet aircraft were ready in time.

A new directorate of Co-ordination of Planning and Programming has been active in starting many new projects, and assisted in the development of standards for terminal buildings, space allotment, the scheduling of the airport development program, and the revision of the long-range airport development program.

Close liaison with the United States Federal Aviation Agency was continued and one meeting was held in Washington on May 20 and 21, 1959.

Training

A 19 per cent increase in the number of aviation personnel licences in force reflects the increasing activity in this phase of operations. A total of 3,489 private pilots were licensed during the year, of which 2,624 were trained under the Department sponsored assistance plan for private pilot training. Forty-three clubs and 76 schools approved by the Department participated in this training program.

Aviation personnel licences in force at the end of the fiscal year were as follows: pilots—glider, 385; private, 11,237; commercial, 2,449; senior commercial, 434; and airline transport, 1,184; air traffic controllers, 741; flight engineers, 55; aircraft maintenance engineers, 1,104.

The Department's new Air Services School at Ottawa Airport held its first graduation on February 19. Sixteen students in air traffic control graduated

following an intensive 12-week theoretical course of training. Following a three-month 'on the job' training in control towers, they will be required to pass practical tests before becoming full-fledged air traffic controllers.

A total of 60 instructors were graduated from two flying instructor courses sponsored by the Department and managed jointly by the Royal Canadian Flying Clubs Association and the Air Industries and Transport Association of Canada.

Twenty-one students were graduated in the M.A. course in meteorology, given in co-operation with the University of Toronto, and the course in progress at the end of the year had an enrolment of 14 students.

Thirty-six students were enrolled in the sixteenth meteorological officers course given from June to December.

Two refresher courses were given, one for meteorologists and one for meteorological officers, with 15 employees from offices across Canada attending each. With the rapid advances being made in physical meteorology and in numerical-dynamical forecasting methods, the need for and the value of such refresher courses will continue to increase.

On October 21 the radiosonde training school was transferred from Hanlan's Point, Toronto Island, to Scarborough. A total of 44 radiosonde trainees was enrolled during the year, 28 of whom were successful in completing the course.

Regional schools continued training all new meteorological technicians, radio operators, contract employees and others engaged in taking weather observations. The Canadian Marconi Company and Canadian Aviation Electronics Limited, the companies handling Mid-Canada Line operations, also sent their employees to the Regional schools for training. With the opening of the new Air Services School at Ottawa Airport, the major portion of training will be transferred there.

Radio operators receiving secondary training totalled 280; 120 radio technicians received maintenance training in one or more of the following subjects: marine radar, surveillance radar, teletype, UHF multi-channel transmitters and receivers, weather radar, radio facsimile, VOR calibration, Elmux error correcting equipment, and aircraft radio. Six engineers received instruction in theoretical and practical aspects of ILS, VOR and radar.

In addition, much time was devoted to planning the Telecommunications portion of the Air Services Training School and basic supplies and equipment were ordered.

Air Traffic Control

The 28 airport traffic control towers operated by the Department at the major terminal airports recorded a total of 3,055,533 landings and take-offs, a decrease of .86 per cent under the previous year.

Traffic handled by the Department's eight area control centres increased. Fix postings totalled 3,042,739, an increase of more than 12 per cent over the previous year; IFR flight plans totalled 801,939, an increase of some 7 per cent; and VFR, 228,487, an increase of 1.08 per cent.

Approach control units were opened at Gander, Quebec, Montreal, Toronto, Lakehead, Regina, Saskatoon and Vancouver, making a total of 14 such units

in operation in 1959. These units provide standard separation to aircraft in accordance with the instrument flight rules within a specified area, usually within a 30 or 40 mile radius of the airport.

Airports

Treasury Board policy for capital assistance for small airport construction, adopted in October 1958, went into operation this year. Grants-in-aid totalling \$11,287 were paid to the village of Aguanish, Que., the city of Granby, Que., and Revelstoke, B.C., as further payments for airport development commenced earlier under the previous policy. Cost-sharing assistance amounting to \$55,929 was provided for airport construction at Sarnia, Ont., Lac La Ronge, Sask., and for initial development of an airport to serve the mining area at Rankin Inlet, N.W.T.

During the year, the Department took over the operation and maintenance of the airport at Fredericton, N.B.

Plans were completed for the opening of the two major airports at Halifax and Edmonton, and for the opening of the new terminal buildings at Halifax and Ottawa.

Operational Requirements—A continuing study and analysis was carried on with regard to operational requirements of aircraft and their application with respect to airport zoning; approach, runway and obstruction lighting runway surface markings and other visual aids to landing, navigation and surface movement of aircraft; planning and developing secondary airports; and airport, heliport and seaplane base licensing.

Particular emphasis was on studies of the noise abatement problem caused by jet engine characteristics. Special flight procedures have been implemented at Montreal, Toronto and Winnipeg. Liaison has been established with aircraft and airport operators, municipalities and the National Research Council in devising ways and means of coping with this problem.

Development—Work progressed on modernizing and bringing existing airports up to higher standards to cope with the larger-type aircraft and greater traffic density. This included the construction of runways, taxiways, parking aprons, improved access roads, provision at major airports for under-apron refuelling, water and sewer facilities, and lengthening and strengthening existing pavements. Considerable work was also completed on load-testing operations at a number of airports.

Development of new airports already underway was continued at Halifax, N.S.; Sherbrooke and St. Joseph d'Alma, Que.; Sault Ste. Marie, Ont.; Edmonton, Alta.; Prince Rupert, B.C.; and Inuvik, N.W.T.

Air Terminals—The new terminal building at Gander, Nfld., was formally opened by Her Majesty Queen Elizabeth II on June 10. Improved terminal facilities were completed at Abbotsford, B.C. Substantial progress was made on terminals underway at Halifax, Montreal, Ottawa, and Regina.

Excavation and drainage for the new Toronto International Airport terminal building was completed and contracts were awarded for the foundations and structural steel, with substantial progress being made.

A contract was awarded for site preparation, excavation and caisson work for a new terminal at Winnipeg.

Planning was completed and tenders were prepared for the foundation contract for the new Edmonton International Airport terminal building, and for the construction of a smaller terminal at Williams Lake, B.C.

Other terminals in the planning stage were for North Bay and Sault Ste. Marie, Ont.; Port Hardy, Prince Rupert and Vancouver, B.C.; and Frobisher, Inuvik and Yellowknife, N.W.T.

General Buildings—Major projects completed included living quarters, a four-room school, five warehouses and an administration building at Frobisher, N.W.T.; stores and northern shipping building, Montreal; maintenance garage and double dwelling at Terrace, B.C.; staff dwellings and hydrogen generator building at The Pas, Man.; and two single dwellings and transmitter building at Wrigley, N.W.T.

Various radio buildings were completed at Gander, Nfld.; Halifax, N.S.; Montreal, Que.; Lakehead, Ont.; and Beechy, Sask.

Other main building projects underway include the construction of a remote-receiver building, transmitter building and a radio range building at Halifax; a power house at Saint John, N.B.; conversion of 21 Butler buildings to married quarters, a hydrogen generator building, storage and maintenance garage, warehouse and semi-detached dwellings at Frobisher, N.W.T.; 30 double staff dwellings and two single men's living quarters at Goose, Lab.; equipment building, standards laboratory building and power-plant building at Ottawa; single dwelling, two storehouses, hydrogen generator building and heating plant at Port Harrison, Que.; three double and one single dwelling at Kenora, Ont.; a powerhouse at Regina, Sask.; prefabrication and erection of various buildings at Cambridge Bay, N.W.T.; hydrogen building, warehouse, maintenance garage, powerhouse and boiler house, and various radio buildings at Inuvik, N.W.T.; and five double staff dwellings, a radio range and transmitter building at Williams Lake, B.C.

Work is underway for providing radio buildings at Corner Brook, Nfld.; Halifax and Yarmouth, N.S.; Fredericton, N.B.; Seven Islands, Que.; Frobisher, N.W.T.; Cardinal and Lakehead, Ont.; Donovan and Regina, Sask.; Terrace, B.C.; and Dease Lake, Y.T.

Other major construction included central heating plants at Halifax, Quebec, and Montreal.

Power and Lighting—Airport lighting facilities were under construction at 13 sites, and the establishment of power facilities was in process at 12 locations.

Maintenance—As a result of the extensive runway construction program, there was a substantial increase in the operational areas required to be maintained, and cleared of snow and ice in winter. Expenditures on airport operations and maintenance rose from \$14,000,000 the previous year to approximately \$17,500,000.

Revenues—Revenues from airport operations, rentals and concessions totalled \$9,377,040, compared with \$8,608,150 the previous year. This increase resulted partly from more business and partly from developing new sources of revenue, such as car-parking lots, concession shops, and insurance counters.

Aircraft Accident Investigation

There were 322 accidents involving Canadian registered aircraft engaged in civil flying, minor accidents excluded. The ratio of accidents to the number of commercial aircraft registered decreased by 2.74 per cent, whereas the number of such aircraft registered increased by more than 7 per cent. In the past two years, there has been a noticeable reduction in the total of aircraft accidents, which reached 396 in 1957.

In 1959, the facilities of the National Research Council and other government laboratories were used to an increased extent in the investigation of technical failures contributing to aircraft accidents. A further development of this process is under study.

Air Carriers

Of the 489 commercial air carriers operating the various types of commercial air services in Canada, 292 were Canadian and 197 foreign and Commonwealth.

Flight Operations

By the end of the fiscal year, the Department had a fleet of 35 fixed-wing aircraft and 17 Bell helicopters. These aircraft are required for a variety of duties such as training, calibration of radio aids to navigation, executive transportation, and inspection duties, including aircraft accident investigation.

Six Bell helicopters were purchased for duties aboard new departmental icebreakers. Two helicopters are operated by the Department on behalf of the Department of Mines and Technical Surveys, based on the Hydrographic Survey ship, CMS *Baffin*, operating along the Maritime Coast and in the Eastern Arctic during the summer.

Aeronautical Engineering

In connection with technical supervision over all civil aircraft operators and manufactures, 2,870 aircraft were inspected and 1,133 visits were made to various organizations. Thirteen company approvals of engineering and inspection facilities were granted to operators, manufacturers and repair and overhaul organizations. Air engineer examinations totalled 946.

Radio and Television

The number of licensed radio stations in Canada at the end of the fiscal year totalled 62,300, a net increase of approximately 5,300 over the previous year. Included are stations operated by departments of the Federal, Provincial and Municipal Governments, stations on ships and aircraft registered in Canada, and mobile stations operating in the public and private land mobile services.

Twelve private commercial broadcasting stations (television) commenced operation during the year; five of these new stations were television rebroadcasting stations using "off-the-air" pickup.

During the year the Department granted five temporary authorities for experimental stereophonic sound broadcasting, involving nine private commercial broadcasting stations. In addition, one of these stations was granted temporary authority to conduct experiments in compatible single sideband transmission.

Suppression of Inductive Interference

During the year 25,188 sources of interference were located, and suppression was obtained in all but a few cases having no economic cure. This total is 37 per cent higher than the previous year, mainly because of a number of defective power lines. Commercial and industrial equipment, with 3,057 sources, was down 23 per cent, whereas R.F. communications equipment with 2,422 sources, and household apparatus with 1,387 sources, were 22 per cent higher than the previous year.

Several years ago agreement was reached with the Radio-Electronics-Television Manufacturers Association of Canada that its members would suppress all television receivers subsequently manufactured, to a conducted noise level of 200 microvolts. Since then, interference caused by television receivers has rapidly declined. During the year there were only nine cases of interference caused by current model receivers; a few years ago the number ran to 400 or 500 per year.

New equipment has been procured for the investigation of interference and has been installed in a number of cars. Considerable progress has been made in developing Direction Finding equipment for use with the regular interference car receivers.

Monitoring Service

The tractor-trailer mobile monitoring station was completely fitted out with advanced electronic equipment, particularly suited to UHF radiation measurements. Investigations have been completed on certain radar transmitters to determine data on harmonic and spurious radiations, heretofore unknown, to be used in spectrum conservation planning and compatibility studies, necessary in successful co-existence of communications systems.

Spectrum policing and surveillance was emphasized during the year, and the Monitoring Service reported a total of 4,340 technical and operational violations of the Radio Regulations during this period. In addition, approximately 150 unlicensed radio stations were reported, and action was taken to bring them under control.

During the year a program of spectrum scanning by photographic means was initiated for the purpose of selecting inactive channels which would be suitable for assignment to Canadian stations. In the latter part of the year, over 100 frequencies in the spectrum from 3 to 27 mc/s were recommended as being suitable for specific types of operation.

Safety Radio Surveys and Inspections

The Radio Regulations Division inspection organization, with 28 field offices across Canada, conducted surveys and inspections of 23,258 radio stations of all classes to ensure compliance with Canadian Law, International Convention and Treaty, as applicable. This included 4,007 surveys and inspections of Canadian and foreign ships conducted under the provisions of the International Convention for the Safety of Life at Sea, the Canada Shipping Act and the Canada-U.S. Great Lakes Agreement; as a result, 2,391 Safety Radio and Radio Inspection Certificates were issued. This is a substantial increase over the previous year, caused in part by the increased use of radio by owners of the smaller-type vessel and the influx of foreign (radiotelephone equipped) deep sea vessels into the Great Lakes with the opening of the St. Lawrence Seaway.

During the year, 2,128 inspections were made of Canadian radio-equipped aircraft. This was a substantial increase over the previous year, indicative of the more extensive use of radio communications and navigation apparatus in aircraft operating techniques.

Radio Aids to Navigation

The transfer of the Yukon and Northwest Territories radio system from the Royal Canadian Corps of Signals to the Department was completed during the year. This system consists of a chain of 19 stations, extending from Edmonton to Aklavik, providing communications along the Mackenzie River route.

Very High Frequency Omni ranges (VOR) were commissioned at Medicine Hat, Lethbridge, Empress, Calgary and Edmonton, and VOR airways from Lakehead to Calgary and Calgary to Edmonton were established. Vancouver and Gander VOR's were also commissioned and construction commenced on similar installations at Sydney, Halifax, Charlottetown and Moncton. Preliminary work has started at Yarmouth, N.S., and Fredericton and Saint John, N.B. When these are completed, the VOR airways will be extended through the Maritimes to Gander.

New Instrument Landing Systems (ILS) were commissioned at Fredericton, Quebec, Frobisher and Terrace, and the installation at Lethbridge was recommissioned after being out of service for a considerable period during runway construction.

Additional air-ground facilities were provided at Montreal, Toronto, Lakehead, Winnipeg, Regina and Calgary to service Canadian Pacific Air Lines trans-continental flights.

The Department purchased four Decca Navigator Chains and arranged for their operation as a navigation aid for shipping. These chains are centred in eastern Newfoundland, southwestern Newfoundland, Halifax and Quebec, and provide coverage on the East Coast, Cabot Strait and the lower St. Lawrence.

In the north, service to ships from Frobisher was improved by the addition of radiotelegraph frequencies, and an increase of power on the existing radiotelephone frequencies. Arrangements were also made to include marine frequencies

at Coppermine and Cambridge Bay, and a radioteletype circuit replaced the previous manual radiotelegraph circuit between Churchill, Man., and Coral Harbour, N.W.T.

A former radiobeacon at Goderich, Ont., was modified to make it suitable for both aviation and marine interests. At Grindstone, M.I., and Tofino, B.C., a radiotelephone duplex service was added to existing marine radio facilities.

Radio communications provided by the Battle Harbour, Lab., station were moved to the nearby Battle Harbour Loran station and the old establishment was closed down.

During the year the radar maintenance program was expanded. Most of the airways and airport surveillance radars were commissioned and regular maintenance by departmental specially trained crews commenced. At Gander, maintenance of the Department's first GCA radar was undertaken, and an extensive marine radar maintenance program was instituted, both with regard to departmental vessels and those of other Government departments.

Government Telegraph and Telephone Service

In Cape Breton, N.S., the rehabilitation of some sections of existing telephone lines was continued, with new construction limited to providing a relief circuit in the Whycocomagh area and the extension of an existing circuit east of Lake Ainslie. A survey was undertaken of the Marion Bridge area by a combined party of the Maritime Telegraph and Telephone Company and departmental officials, preparatory to reaching an agreement on the eventual takeover of all Government lines in Cape Breton. The two remaining telegraph offices—at Gabarouse Lake and Fourchu—were converted to “phonogram” service, with the traffic being re-routed via the Canadian Pacific office at Louisburg.

The telephone lines in the Chatham, Escuminac and Richibucto areas of New Brunswick, acquired by the New Brunswick Telephone Company last year, were reconstructed by the Company in accordance with an agreement with the Department. Reconstruction included the installation of dial telephone service for all subscribers.

In the Magdalen Islands, the expansion of the telephone plant in general was continued, culminating with the cut-over of the new automatic telephone exchange on Grindstone Island and the completion of the cable plant in that area. The extension of the Alright automatic exchange and the outside cable plant was also completed and placed in service. The work of rehabilitating subscribers' lines was continued to the extent that very little open wireline remained at the end of the year. Materials were delivered, which, when installed, will increase the trunking facilities between Grindstone and the mainland, (Sydney, N.S.), and between Grosse Isle and Grindstone.

Revenue

Total Telecommunications revenue from all sources amounted to \$2,860,979.

Meteorological Services

Seventy-seven inland regions and 41 marine areas provided Canada with public weather forecast information. Forecasts of expected weather conditions for the next two days were issued four times daily for each of the inland regions, and marine area forecasts, describing weather elements of particular interest to mariners, were issued three times daily. Separate forecasts were also provided regularly for 23 Canadian cities. The forecasts were widely distributed, chiefly through the media of radio, television and the daily press. These general forecasts were supplemented by specially prepared forecast advice for agriculture, forestry, industrial and government interests.

In addition to routine forecasts, the principal forecast offices supplied weather service for a number of special aviation operations, including commercial jet operations, various military exercises, special Arctic operations and sea ice surveys.

Meteorological services to international flights from terminals in Canada and through areas for which Canada has been assigned responsibility continued to increase. This increase was primarily because of the introduction of increasing numbers of long-range turbine-powered aircraft rather than an increase in the number of flights. ICAO statistics for the North Atlantic indicate a 12 per cent increase in passenger route miles in 1959, with little or no increase in the number of flights. In order to meet increasing demands for meteorological service to turbojet aircraft, plans, under development for some time, were implemented. A central office at Montreal was established to forecast winds, temperatures and enroute weather for North Atlantic flights served by facilities in eastern Canada.

Additional communication facilities were obtained and by January, 1960, forecasts prepared on a routine basis at Montreal were relayed by facsimile to Gander, Goose, Frobisher and Toronto.

Studies are continuing on the most economical procedures for supplying high-level long-distance forecasts on routes from Canada to Central America and across the Pacific.

Expanded Services

To meet an increasing requirement for weather services in Newfoundland, a third inland forecast and a fourth marine forecast were added to the daily schedules.

Arrangements were made for an expanded coverage of broadcasts of marine area forecasts from the east coast marine radio stations and for earlier issue of hurricane advisories when a hurricane poses a threat to shipping in Maritime coastal waters.

Plans were completed for opening a weather office in London, Ont. Because of the critical shortage of professional staff, the opening of the weather office at Fredericton, N.B., was postponed, and is scheduled for the beginning of the next fiscal year.

Weather Information

Enquiries for weather information steadily increased and many requests were received from educational institutions for publications designed for teaching meteorology in science courses. Staff members assisted in the instruction of Air Cadets, power boat squadrons, Boy Scouts and similar organizations whose studies included meteorology.

Communications

The meteorological teletype system continued to expand during the year and reached a total of 55,200 miles of circuit with 327 stations served by 522 connections. Thirty-one offices were added to the teletype system during this period.

The Canadian weatherfax system increased to a total of 11,300 airline miles of circuit, serving 64 stations equipped with 65 connections. Five stations were added to this system.

Instruments

Evaluation and maintenance studies were conducted on a commercially-made automatic weather observer (A.W.O.) at the Scarborough field test site. This equipment takes observations of altimeter setting, temperature, dew point, wind direction and speed, precipitation and visibility, and upon demand transmits this data on a teletype circuit. The unit as received and tested to date has required such frequent maintenance service as to seriously reduce its operational value. Some sensor modifications have been tested, and it is planned to make an additional extensive modification of the type that is being adopted by the U.S. Weather Bureau to improve the equipment reliability.

New instruments developed for the tobacco fleck project of 1960 included the new recording instrument for measuring temperature and dew point profiles inside the crop, earth temperature elements, and a recorder for the floating lysimeter.

Hydrometeorology

In its first full year of operation, the Hydrometeorology Section expanded its program of network development and research. Arrangements were made for the installation of 26 new recording rain gauges for rainfall intensity measurements and of 10 new class "A" evaporation pans at strategic locations in Canada. Plans are underway for processing hourly rainfall and rainfall intensity data by machine methods.

Much time was devoted to the hydrometeorological aspects of a large-scale Great Lakes geophysical research program under the general direction of the University of Toronto. The first phase of a study of the water budget of the Great Lakes was completed, and investigations of the energy budget and ice formation on Lake Ontario were started. An extensive project on critical meteorological conditions for flood production on Quebec North Shore rivers neared completion. Papers on maximum precipitation and hydrometeorological data were

prepared for the National Research Council's First Canadian Hydrology Symposium, and a set of rainfall intensity-duration-frequency maps for Canada was produced.

Microclimatology

During the year the new Microclimatology Section was established. Its main activity was a continuation of the study on the meteorological conditions associated with the flecking of tobacco leaves in Norfolk County, Ont. Early in June, a complete microclimatological station and five satellite stations were established near Port Burwell, Ont. Observations of temperature, humidity, and wind up to a height of 100 feet were undertaken, along with careful observations of dew formation, radiation, precipitation intensity, soil moisture, and soil temperature in and near the crop. This was carried out in collaboration with the Federal Department of Agriculture, the Ontario Research Foundation, and interested commercial organizations, and a comprehensive report was submitted to the inter-departmental committee responsible for this project.

Preliminary planning was undertaken for collaboration with the Ontario Research Foundation on investigations of microclimatological conditions affecting fruit growing in southern Ontario.

Arctic Weather Stations

Special scientific projects carried out by the Joint Arctic Weather Stations included measurement of tides, sea ice thickness, snow temperature gradient and observations of the physical characteristics of snow, both surface and profile. Soil temperature measurements to a depth of 650 feet were continued at Resolute until March 15, 1960, and measurements of radiation, turbulence, and ozone were continued throughout the year.

Ice Forecast and Advisory Services

Ice forecasting and advisory services were provided for shipping operations in the ice-infested waters of the Gulf of St. Lawrence, Cabot Strait, the Strait of Belle Isle, Newfoundland coastal waters, Hudson Strait and Bay, and Arctic areas where shipping is engaged in annual resupply of weather stations and DEW Line sites.

The Ice Central, located in Halifax, issued seasonal outlooks, 30-day forecasts and five-day forecasts for Arctic waters, and 30-day forecasts, five-day forecasts and short-range forecasts for direct tactical support of shipping in the southern areas. A Field Ice Forecast Office operated at Frobisher from early July to mid-October and provided short-range forecasts and advisories for the Hudson Bay route and the Eastern Arctic.

Public Weather Forecast Offices issued weather warnings as a special service to safeguard life and property from unusual weather hazards. Warnings of freezing rain, heavy snow or rain, blizzards, gales and severe cold were provided

to transportation and marine interests, to agencies such as conservation authorities, public utilities, and civil defence organizations, as well as to the press, radio, television and the general public.

Late spring and early fall frost warnings were continued for fruit growers in the Okanagan, Niagara and Annapolis areas. Fruit, vegetable and tobacco growers of southwestern Ontario were provided with special weather advisory and warning services during critical growing periods.

A summary of weather in northern areas was prepared by the Arctic Forecast Office in Edmonton for inclusion in the daily CBC program directed to Arctic residents.

Research

Research and development work was carried out in induced precipitation and cloud physics; air pollution; numerical forecasting of the large-scale patterns of atmospheric motion; high-latitude jet streams; winds and temperatures in the Arctic stratosphere; high-level turbulence; radiative and turbulent fluxes in the atmosphere; diffusion of particulate matter; calibration and behaviour of radiation instruments; vertical velocities; and low-temperature fog.

In Physical Meteorology, most of the research programs initiated during the International Geophysical Year were incorporated into the continuing research program of the Meteorological Branch. A major improvement in the facilities for research in radiation, ozone, and air pollution and turbulence was effected with the consolidation of the groups working in these fields into a Physical Research Unit at the field station in Scarborough.

Radiation—The radiation network is comprised of 25 branch and co-operating stations, in addition to the national radiation centre at Scarborough. The centre maintains a group of reference standard radiation instruments, which are compared with international standards at regular intervals, and is responsible for quality control of measurements in the radiation network. Through the facilities of the Machine Processing Section of the Climatology Division, current radiation data are placed on punched cards and final data tabulations prepared by machine methods. This improvement in radiation data processing has permitted the publication of a new Monthly Radiation Summary starting with January, 1960. This publication makes Canada one of the world leaders in the promptness and completeness of publishing such data. Other projects in radiation included the construction of a darkroom for optical bench experiments, construction of a cold chamber for temperature tests on radiation instruments, development of an automatic system for evaluation of radiation record charts, experimental work on net radiometers, and the acquisition of a number of additional standard instruments to improve the standardization and calibration facilities of the radiation centre.

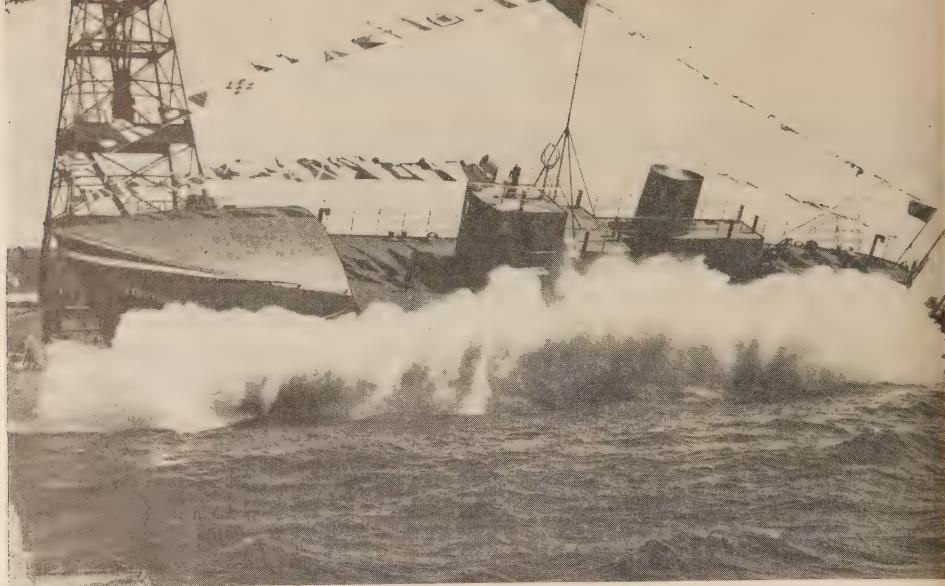
Ozone—The ozone research program was continued with research instruments at Resolute, Edmonton, Moosonee and Scarborough. As a result of the vigorous ozone research program, the Superintendent of Atmospheric Research presented eight scientific papers at the International Ozone Symposium at Oxford in July.

Air Pollution—The air pollution study in the Windsor-Detroit area was completed at the beginning of the fiscal year, and basic research studies in air pollution and atmospheric diffusion continue. Meteorological advice and assistance on air pollution projects have been given to federal, provincial, municipal and industrial groups. In particular, close co-operation has been maintained with the Occupational Health Division of the Department of National Health and Welfare.

Cloud Physics—Two major projects are underway in this field. The precipitation physics project was started this year, operating in the Noranda-Rouyn area, in co-operation with the National Research Council and other interested agencies. The purpose of the project is to study the chain of cause and effect in precipitation mechanisms and provide an assessment of the effect of silver iodide seeding of major weather systems over relatively flat terrain. The project employs an aircraft to seed the clouds.

In the other project—the Alberta Hail Studies—the research begun in 1956 was continued and the project was enlarged by the addition of a network of micro-barograph stations in order to make a study of the effect of pressure jumps on hail storms.

Numerical Weather Prediction—Substantial experimental and development work was conducted on numerical weather prediction and analysis methods using high speed electronic computers. These techniques offer the main hope for improvement in the accuracy of weather forecasts and for handling the large quantities of data required in modern meteorological services. Experiments carried out during the year show that numerical weather prediction techniques should be introduced on an operational basis within two years' time.



Launching Lightship No. 4 at Kingston, Ont., for Quebec Marine Agency.

MARINE SERVICES

Aids to Navigation

During the year under review, the number of lights was increased to 3,074 from 3,022, and lighted buoys to 921 from 850. The total number of aids of all kinds increased by 534 to 15,692, including 12,200 buoys, beacons and markers.

Construction

A light and fog-alarm station was constructed at Bunker Island, N.S., and a combined light, fog-alarm and radio beacon station was completed at Cape St. Francis, Nfld.

Two major light and fog-alarm stations were nearing completion at Bonilla Island and Cape Scott, B.C. Continued progress was made in the program of conversion to modern automatic lighting equipment.

In addition, 36 dwelling units, two major concrete light towers and five fog-alarm buildings were constructed by contract, either to replace obsolete structures or to provide additional dwelling accommodation at existing light stations.

The overall program of providing aids for the Seaway channels continued. In this connection, soil investigation programs to determine foundation requirements for proposed light piers in Lake St. Francis and Amherstburg Channel, Ont., were carried out. A number of new shore lights were constructed and several existing range lights were relocated to suit the new channels in the Amherstburg region of the deep waterway extension of the Seaway.

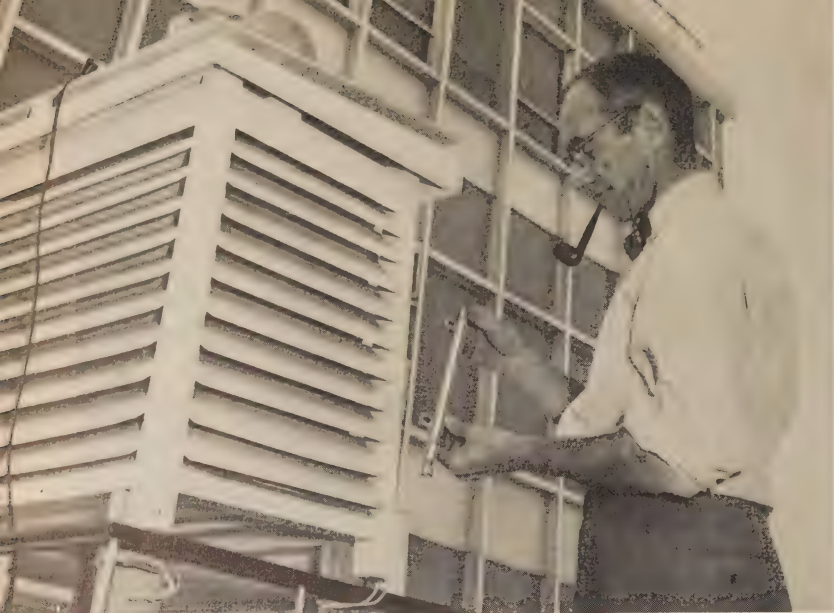
Construction of a new office and stores building for the Halifax Marine Agency, new marine wharves for the Saint John, N.B. and St. John's, Nfld. Agencies were completed.



C.M.S. *d'Iberville* passing through St. Lambert lock, officially opens St. Lawrence Seaway to navigation, April 25.



Big Chute Marine Railway—Trent Canal System.



Department of Transport weatherman checks Stevenson screen instrument readings at an airport weather forecast office.

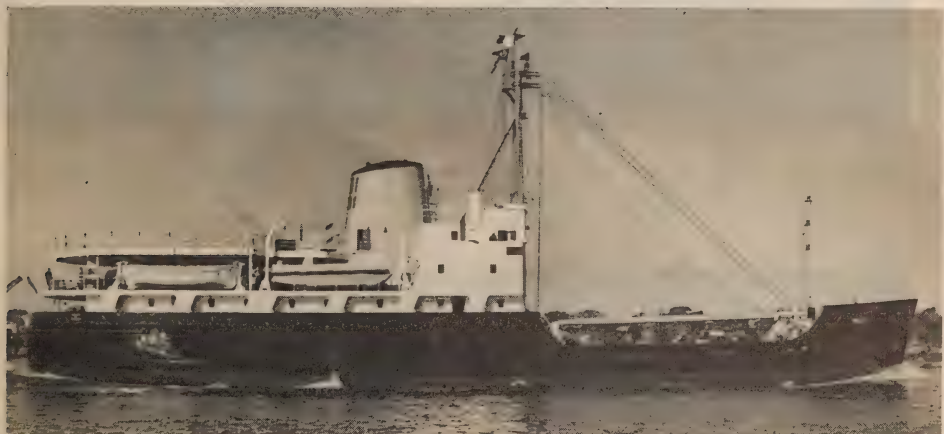


Department of Transport jetty at Frobisher Bay.



Runway snow clearance—one of many problems of airport maintenance.

A Department
of Transport
helicopter on
reconnaissance
flight near
Eureka, N.W.T.



C.M.S. Wolfe, one of nine ships completed for the Department during the year.

St. Lawrence
River oil
pollution
patrol boat.





At the Department's Air Services School at Ottawa Airport, air traffic control students receive basic training on a unit that simulates actual aircraft movements and control tower operations.



The extension to the Queens' Wharf at the Quebec Marine Agency was 70 per cent completed, and an extension to the wharf at Prescott Marine Agency was completed. Final designs for the new office and stores and shops buildings at Saint John, N.B., and a shops building at Halifax, N.S., were completed and a contract was awarded for the latter. Preliminary designs for the office and stores and shops buildings at St. John's Nfld., and for the new Agency wharf at Charlottetown, P.E.I., were completed.

Preliminary engineering studies and design and soil investigation involving borings were carried out for a new lighthouse pier and building structure to replace the lightship at Prince Shoal in the St. Lawrence River below Quebec.

In addition to these major projects, several new minor lighthouse towers were constructed and the regular repair program was continued.

Mechanical Equipment

During the year, new fog-alarm machinery was provided for 16 stations, including new establishments at St. Shott's, Bell Island and Portugal Cove, Nfld., and Bonilla Island, B.C.

New hoisting equipment, power winches and tractors were furnished at a number of major lightstations, and several additional stations where no commercial power was available were equipped with diesel generating units.

Special Equipment

Continued improvements were made in the development of micro-wave remote control systems for fog alarms as the result of experience with the experimental installations at Pelee Passage, Lake Erie, and Barrett Rock, B.C.

New types of fluorescent lighting equipment were tested at Prescott to determine their suitability for use in the service, and work proceeded with a view to modernizing the design of certain older types of lighthouse apparatus.

Public Harbours

There were 335 public harbours controlled by the Department during the year. Of these, 125 were in charge of Harbour Masters, who were remunerated out of harbour dues collected. Collections totalled \$194,380, an increase of \$2,954 over the previous year.

Harbour Commissions

The number of active Harbour Commissions remained nine—Belleville, Hamilton, Toronto, Windsor and Lakehead in Ontario; Winnipeg-St. Boniface, Manitoba; and New Westminster, North Fraser and Port Alberni in British Columbia.

Government Wharves

There were over 2,500 wharves, piers, breakwaters, etc., under administration, 550 of which were in charge of wharfingers, who were paid from fees collected. Wharfage collections amounted to \$897,135, an increase of \$133,843 over 1958-59.

Water Lots and Lands

Negotiations with the Province of Ontario were well advanced and it was tentatively agreed to consider 27 harbours as federal property. Surveys of these Ontario harbours were completed. During the year, 225 water lot and lighthouse land leases were in effect. Total rental collected was \$34,400.

Canals—Traffic and Freight

On April 1, the Main Line Canals were transferred to the St. Lawrence Seaway Authority. Traffic on the eight canals remaining under the jurisdiction of the Department consisted mostly of pleasure craft.

A total of 108,351 lockages of pleasure craft were reported, compared with 85,266 during the previous year. Lockages of commercial craft also increased from 3,163 to 3,609. Total freight tonnage through the canals increased to 1,172,873 from 871,547 last year.

St. Lawrence Ship Channel

The need for continuous study of the potential effect of future channel improvement on water levels in the Montreal-Sorel reach of the St. Lawrence River, and to maintain liaison with the agency controlling the levels in Lake Ontario, a hydraulic section was set up in the Division. One senior hydraulic engineer and one technical officer were added to the staff.

Work for National Harbours Board—Dredging operations in Montreal Harbour continued under the supervision of Ship Channel engineers. Maintenance surveys and sweeping were conducted at St. Charles River and Wolfe's Cove in Quebec, and at the deep-water berths at Three Rivers.

Work for the St. Lawrence Seaway Authority—This consisted mainly of proving of dredging in the turning basin and Seaway entrance in Montreal Harbour.

Icebreaking

Overseas navigation from the port of Montreal ended with the departure of the SS *Inka* on December 20, two days before the ice pack began building upstream from the foot of Lake St. Peter. By January 6 the channel was closed as far as Victoria Pier in Montreal Harbour.

Icebreakers *Ernest Lapointe* and *Wolfe* opened the channel from the foot of Lake St. Peter to Sorel on December 26. Replaced by the *d'Iberville* the *Wolfe* returned to service below Quebec on January 7. The *N.B. McLean* assisted briefly in the advance toward Montreal, but was recalled to Quebec on January 23 and replaced by the *Saurel*.

Although the channel was open as far as Montreal East on January 27, the icebreakers were hampered by extremely heavy accumulations of drift ice and frazil, and it was not until March 1 that they succeeded in breaking through the last of the Montreal Harbour ice jams near Jacques Cartier Bridge. During this period, water levels exceeded the critical mark more frequently and for longer

periods than in any year on record since the institution of continuous winter icebreaking. There was some flooding in the inner harbour, particularly at Elevator "B".

The winter was marked by two navigational events worthy of note: the arrival from overseas of the SS *Eskimo* at Three Rivers on January 4, departing on January 17 after unloading and taking on cargo and the record early arrival of the same ship in Montreal on March 21. By the latter date, a wide channel had been opened, but practically all shoal ice was still in place. Although the river was not considered safe for daylight navigation until April 14, several overseas vessels were already in port by then.

Saguenay River—The *N.B. McLean*, starting on March 9, made slow progress in the heavy Saguenay ice. Due for a major re-fit, she was replaced by the *d'Iberville* on March 27. Seasonal easterly winds delayed the opening of Port Alfred until April 7.

The St. Lawrence Seaway—The *Ernest Lapointe* entered St. Lambert Lock on April 10. After breaking ice as far as Lancaster Bar on Lake St. Francis, she proceeded to Lachine wharf on April 17 in preparation for placing navigation buoys on Lake St. Louis.

Steamship Inspection

New ships constructed under the inspection of the Department totalled 113, and 59 ships were converted or reconditioned. Vessels inspected totalled 1,742.

There were four new ships built outside of Canada for Canadian registry, and eight existing ships built outside Canada were transferred to Canadian registry. Such inspections of these ships as were necessary were carried out.

Machinery Inspection, Machinery Construction and the Fire Detection and Extinguishing Equipment Regulations were amended for adaptation to changing conditions.

Manufacturers of diesel engines and reduction gears submitted 45 new designs for examination and approval. Approval certificates were issued to all, and a handbook of approved diesel engines and reduction gears was compiled and distributed to all field inspection offices.

Inspections of ships' tackle numbered 4,106, against 3,920 last year. Cases requiring repairs, adjustment or testing of cargo handling gear numbered 128.

Marine Safety—Considerable preparatory work was carried out by delegates designated to attend the Safety of Life at Sea Convention to be held in London, England, in May and June, 1960, under the auspices of the Inter-Governmental Maritime Consultative Organization. Meetings were held with industry and further studies and preparation made for the Convention regarding lifesaving appliances, fire protection and detection, and safety of nuclear propelled ships.

A wider adoption of inflatable liferafts was brought into operation and practical experiments conducted both at headquarters and in the field. There are now

four approved firms, and service stations are established on both the east and west coasts. It is expected that these liferafts will play an increasing role in the safety of life at sea.

Aluminum ship structures were studied with special regard to structural strength, fire-resisting properties and insulation.

The innovation of plastic materials has opened up a new field to which preliminary work was devoted in relation to lifeboats, boats and small ships.

The voluntary program of issuing recommended safe power and capacity plates to outboard motorboat builders continued. A total of 330 separate models have now been issued with these plates, covering a large number of boats built to these models.

The Lifejacket Committee met to consider a report by the Canadian Red Cross of tests on certain styles of lifejackets, following which certain changes to the specifications were adopted. Unicellular foam lifejackets continued to increase in popularity.

The educational campaign on pleasure craft safety continued during the boating season. A Small Vessels officer toured the country, addressing boating groups, yacht clubs, and others concerned. Booths displaying safety equipment were taken at the Canadian National Exhibition and various boat shows. A revised edition of "Safety Afloat" was prepared, and 270,000 copies in English and 35,000 in French were distributed. Demands for the booklet increased steadily.

Oil Pollution Patrol—A motorboat patrol of the St. Lawrence River between Montreal and Three Rivers was again carried on during the summer months to guard against oil pollution. A conviction for a violation of the Oil Pollution Prevention Regulations was obtained in British Columbia. Public notices warning against oil pollution were issued.

Nuclear Power Committees

The Marine Regulations Branch provided one sitting member and the secretary to the Nuclear Power Committee, set up to enquire into the feasibility of marine nuclear propulsion.

The Nuclear Vessel Control Co-ordinating Committee was formally established, with the Director of Marine Regulations its first chairman. The committee is working in co-operation with similar groups in the United Kingdom and the United States.

Drydock Facilities for Newfoundland

The Marine Regulations Branch is making an intensive study to provide suitable drydock facilities in Newfoundland.

Marine Engineer Training

In June, 1960, the first group of trainees under the Department's marine engineering training scheme will have completed four years' shipyard experience

and sound advanced technical training and will be appointed Junior Engineer Officers in the Department's fleet to obtain sea training.

The second group are completing their first year of shipyard apprenticeship and in June, 1959, were assembled for a four-week course designed to show the application of advanced evening classes to marine work.

Engineer Examinations

Candidates for certificates of competency as marine engineer totalled 901, of which 746 were successful and 40 obtained a partial pass.

Under the provisions of Section 139 of the Canada Shipping Act, 511 permits were issued for individuals to act as engineers.

Registration of Ships

The sum of \$11,197.50 was realized from fees charged for various types of registry transactions. During 1959, 52,708 small vessels exempt from registry were licensed under the Small Vessel Regulations, making a total of 304,261 vessel licences issued throughout Canada to December 31, 1959.

To the Canadian registry 1,379 vessels were added, and 929 removed, making a net gain of 450 for this year. As of December 31, 1959, there were 19,507 vessels of 2,472,147 gross tons registered in Canada.

District Measuring Surveyors computed the tonnage of vessels for registry purposes, and sent 1,632 tonnage forms to headquarters for inspection in 1959. Headquarters staff measured 14 vessels for tonnage.

The annual List of Shipping, listing alphabetically all ships registered in Canada, together with such particulars as dimensions, tonnage, ownership and so on, was printed by a new method. A standard marine reference work as up-to-date as a phone book, the list sold at \$5.00 a copy.

Salvage and Rescue

A subsidy contract of \$75,000 with Foundation Maritime Ltd. was in effect during the 1959 navigation season. It required the provision and maintenance of a salvage wrecking plant complete for service in the River and Gulf of St. Lawrence.

A contribution of \$15,000 per annum to the B.C. Towboat Owners' Association for maintenance of services on the west coast was continued. The association provided a marine adviser to co-ordinate air-sea rescue facilities with the services of towboats operating on the B.C. coast.

The Department maintained lifesaving stations at Clayoquot and Bamfield, B.C., and Bay View, N.S. Each station was equipped with a modern motor lifeboat and manned by a full-time crew of seven.

In addition, a full-time and two seasonal patrolmen were employed on the 35-mile West Coast Trail to assist in keeping it clear of fallen timber, repairing bridges and similar duties.

Pilotage

During the fiscal year there were 373 licensed pilots engaged in pilotage in the nine pilotage districts for which the Minister of Transport is the pilotage authority. They performed 44,923 pilotages inward or outward and 13,577 movages. There were 255 casualty reports made by pilots covering incidents of an unusual nature whether or not damage was involved. This number represents less than one-half of one per cent of the pilotage trips and movages performed. A gross amount of \$4,959,977.57 was earned in pilotage fees during the year.

The Department employed approximately 44 pilots during the navigation season to conduct ships from Port Weller to Sarnia, during which time 1,768 pilotages were made. There were 74 casualty reports submitted by pilots in this district during the season, involving incidents in which ships touched more or less heavily against canal or dock walls when going alongside. A gross amount of \$483,259.68 was earned in pilotage fees.

Masters, Mates and Seamen

Examinations held for Masters, First Mates and Second Mates Certificates of Competency and Service totalled 820. In addition, 75 examinations were held in form and colour vision.

A total of 433 Masters, 91 First Mates, and 62 Second Mates were issued with certificates.

A total of 323 renewals of Temporary Masters Certificates were issued for which no examinations were held.

Fees for Masters and Mates examinations and issue of Certificates of Qualification as Able Seamen amounted to \$8,834.00.

Five seamen received Certificates of Qualification as Ship's Cooks, and 66 received Certificates of Qualification as Able Seamen.

Of 177 seamen examined for Certificates of Efficiency as Life-boatmen, 172 were successful and granted certificates.

Navigation Schools

At Quebec, P.Q., Hamilton, Ont., and Prince Rupert, B.C., navigation schools were fully maintained by the Department in the winter months only. The school at Prince Rupert gave instruction chiefly for the benefit of operators of small vessels.

Financial aid was provided in support of navigation schools under local education authorities at Halifax, N.S., Montreal, P.Q., and Vancouver, B.C.

Other navigation schools were maintained by local education authorities and other organizations at St. John's, Nfld., Grindstone and Rimouski, P.Q., and Midland and Owen Sound, Ont.

Marine Casualties

During the fiscal year 1959-60, thirty-one preliminary inquiries into marine casualties were held under the provisions of the Canada Shipping Act.

Departmental Fleet

The Department's lake and sea operating fleet consisted of 48 ships: nine icebreakers, eight light icebreakers, 10 supply and buoy vessels, one Eastern Arctic Patrol vessel, three weatherships, seven workboats, three special service ships operating in the St. Lawrence Ship Channel, and seven Northern Supply vessels.

Personnel of the Department's fleet consisted of 347 Deck and Engineering officers and 973 Petty Officers and Ratings.

All icebreakers were in use for icebreaking in the St. Lawrence River, Saguenay, Gulf of St. Lawrence, Maritimes and Newfoundland. Icebreakers stationed in the Gulf of St. Lawrence assisted over 90 vessels, and broke out approximately 10 ports. Winter navigation was carried out in the Gulf of St. Lawrence with the assistance of icebreakers throughout the winter, which was, however, marked by very moderate ice conditions.

The C.M.S. *Stonetown* and *St. Catherines* which operated the Pacific Weather Station "P", maintained a regular schedule on a rotation basis, and the Station was manned throughout the year.

Northern Transportation

As the responsibility for the resupply of the Baffin Island DEW Line Sites was undertaken by the Department in 1959, the landing craft fleet was increased by an additional eight LCMs, bringing the total landing craft fleet to 130 units.

The first departmental vessel to proceed to the North was the C.M.S. *Ernest Lapointe*, which sailed for Goose Bay June 13 with 40 tons of general cargo consigned to the Department. Buoys and aids to navigation were also placed in position.

The C.M.S. *C. D. Howe* sailed from Montreal June 27 with 1,168 net tons of supplies consigned to 30 different ports in the Eastern Arctic. The ship also loaded a small tonnage at Churchill for ports in the Hudson Bay and Strait. The voyage was completed September 25 with her arrival at Quebec City.

The C.M.S. *N. B. McLean* also sailed from Montreal June 28 with 614 tons of cargo for 15 ports in the North. This ship also carried out ice patrol duties before proceeding to assist the convoy bound for Resolute Bay. The vessel returned to Quebec November 6.

On June 27 the C.M.S. *Labrador* left Montreal on her first voyage bound for Alexandra Fjord, Resolute Bay and Foxe Basin area. Approximately 15 tons of supplies were carried to the R.C.M.P. Detachment at Alexandra Fjord. The ship docked at Quebec November 7 on completion of all her assignments.

Operation NORS 59 commenced with the sailing of the C.M.S. *d'Iberville* from Montreal July 23 with 250 tons of oil and general supplies consigned to the Joint Weather Station at Eureka and some cargo for discharge at Resolute Bay. At Quebec on July 29 the vessel formed convoy with the S.S. *Federal Voyager* and M.V. *Irvingwood* and proceeded to Resolute Bay and Eureka. The ship returned to Quebec September 11. The *d'Iberville* also made a second trip to the North,

sailing from Quebec September 19. This voyage was in support of the BMEWS supply ships. The ship called at Sugluk, Resolution and Brevoort, returning to Quebec, October 22.

The C.M.S. *Edward Cornwallis* left Montreal July 10 with 698 tons of cargo for ports in the Strait and Bay. The ship also did ice patrol work in the Strait for various periods during the season. She returned to Halifax on September 12.

Also on July 10 the C.M.S. *Montcalm* left Montreal for points in Baffin Island, Hudson Bay and Strait with 438 tons of general cargo. She was assigned icebreaking duties in Baffin Island DEW Line sites and returned to Quebec October 21.

In early November the C.M.S. *Ernest Lapointe* again returned to Goose Bay with about 30 tons of winter supplies and also to place winter buoys and close the port for the season.

Two new departmental vessels made maiden voyages to the North in 1959. These were the *Sir William Alexander* and the *Sir Humphrey Gilbert*. The first vessel left Montreal on September 8 and supplied stations on Baffin Island, Hudson Bay and Strait, returning to Halifax November 5. The second ship made two voyages. On her first trip she acted as Commodore ship for the Foxe Basin DEW Line convoy; her second voyage was to Frobisher Bay with an emergency shipment late in the season. She sailed from Montreal on August 18 and returned to St. John's, Nfld. October 27.

In addition to the Departmental vessels, 31 commercial ships carried approximately 100,000 tons of general cargo and P.O.L. products to various stations in the North. Well over 300 passengers and departmental personnel were transported between ports of call by all vessels.

Ship Construction and Repair

Construction of the following ships was completed during the fiscal year:

Icebreaker, supply and buoy vessel *Sir Humphrey Gilbert* for service in the Gulf of St. Lawrence, Newfoundland, and Northern waters.

Light icebreaker, supply and buoy vessel, *Sir William Alexander* for service in Maritime waters.

Icebreaker, supply and buoy vessel *Wolfe* for service in the Maritimes, Newfoundland, and Northern waters.

Light icebreaker, supply and buoy vessel, search and rescue *Tupper* for service on the East Coast.

Light icebreaker, supply and buoy vessel, search and rescue *Simon Fraser* for service on the West Coast.

Icebreaker, supply and buoy vessel *Camsell* for service on the West Coast and Western Arctic.

Light icebreaker, supply and buoy vessel *Alexander Henry* for service on the Great Lakes.

Supply and buoy vessel *Verendrye* for service at Sorel Agency.
Lightship No. 4 for service at Quebec Agency.

The following ships were being built but not completed during the year under review:

Icebreaker *John A. Macdonald* for service at Quebec and in Northern waters.

Survey vessel *Ville Marie* for the St. Lawrence Ship Channel services.

Sounding vessel *Beauport* for the St. Lawrence Ship Channel services.

Light icebreaker, supply and buoy vessel *Thomas Carleton* for service in the Bay of Fundy.

Automobile and passenger ferry *Pelee Islander* for service between Pelee Island-Leamington, Ont.

Automobile and passenger ferry *John Guy* for service between Bell Island and Portugal Cove, Newfoundland.

Automobile and passenger ferry for service between Cape Tormentine, N.B. and Borden, P.E.I.

Passenger and cargo vessel for Newfoundland Coastal service.

Passenger and cargo vessel for Labrador Coastal service.

Two passenger and cargo vessels for service in the West Indies Federation.

Three 56-foot landing barges for Northern supply service.

Design plans were under way for four vessels, viz., a shallow draft buoy vessel for Mackenzie River service, a pilot boat and a work boat for Saint John, N.B., and a protection vessel for the Department of Fisheries.

Expenses for repairing and refitting departmental vessels totalled \$2,307,000.

RAILWAY SERVICES

Canadian National Railways

The operations of the Canadian National Railways for the year 1959 resulted in a deficit of \$43,588,290 compared with a deficit of \$51,591,424 in 1958.

Prince Edward Island Ferry and Terminals

The deficit in the operation of this service for the calendar year 1959 amounted to \$2,566,090, compared with a deficit of \$1,987,689 for 1958.

During the fiscal year improvements costing \$59,048 were made on the *Scotia II*, one of the ferries operating in this service during the summer months.

A contract was awarded in December 1959 for a new ferry for this service, which is expected to be delivered in the early summer of 1961. Expenditure on the new ferry during the fiscal year amounted to \$29,734.

The movement of highway vehicles to and from Prince Edward Island continued to increase. In 1959 some 164,115 vehicles were handled compared with 144,381 in 1958, an increase of 19,734 or approximately 14 per cent over the previous year.

Newfoundland Ferry Service

This service operated at a deficit of \$5,799,886 during 1959, compared with \$5,770,651 in 1958.

In addition to the regular freight and passenger service operated between North Sydney, N.S., and Port aux Basques, Nfld., a freight service, only, was operated throughout the year between North Sydney, N.S., and various other Newfoundland ports.

Due to abnormal ice conditions in the Cabot Strait and in North Sydney during the winter months, regular trips to North Sydney could not be maintained and it was necessary to re-route the back-log of traffic to Mulgrave. This resulted in heavy expense for extra handling of shipment and increased the deficit in the operation of the service over the previous year.

During the fiscal year bow propulsion equipment and a filtering system was installed on the M.V. *William Carson* at a cost of \$167,923.

Docks and Terminals—Expenditures for additions and betterments to the terminal facilities at North Sydney during the fiscal year amounted to \$4,223, bringing the total expenditure on the new dock and terminal facilities to \$3,626,221 at March 31, 1960.

At Port aux Basques expenditures for additions and betterments to the terminal facilities during the fiscal year amounted to \$3,804. Total expenditures to March 31 amounted to \$6,248,160.

Yarmouth, N.S.—Bar Harbor, Maine, Ferry Service

Traffic handled during 1959 consisted of 91,716 passengers compared with 88,006 in 1958.

Vehicles carried totalled 30,313, an increase of 1,048 over 1958.

The deficit at which the service has operated since its start in 1956 has steadily decreased from \$304,350 during its first year to \$194,203 in 1959.

Canso Causeway

Construction expenditures on the Canso Causeway during the fiscal year amounted to \$19,960, bringing the total construction cost to \$20,157,201.

In addition \$8,138 was spent during the year on maintenance and repairs.

Railway Subsidies

The construction of the C.N.R. Beattyville, Chibougamau, St. Felicien Branch Line was completed in 1959, the last section between St. Felicien and Cache Lake being completed and officially opened on October 28.

During the fiscal year the balance of the Government subsidy towards the construction of this branch line, amounting to \$1,035,750, was paid to Canadian National Railways.

The length of the branch line is 294.43 miles and the total subsidy paid by the Government toward the construction amounted to \$7,360,750.

Maritime Freight Rates Act

Payments under the Maritime Freight Rates Act during the fiscal year amounted to \$14,261,201, an increase of \$1,110,451 over the previous year.

FINANCIAL SERVICES

Comparative Summary for the Fiscal Years Ended March 31, 1959 and 1960

<i>Millions of Dollars</i>			
			<i>Increase (+) or Decrease (—)</i>
	<i>1959-60</i>	<i>1958-59</i>	
<i>Administration, Operation and Maintenance Expenditures</i>			
Departmental Administration	2.7	2.4	.3 (+)
Air Services	59.5	52.3	7.2 (+)
Canal Services	3.0	7.1	4.1 (—)
Marine Services	28.2	24.8	3.4 (+)
Railway and Steamship Services	67.8	75.3	7.5 (—)
Miscellaneous Services	38.3	29.4	8.9 (+)
	<hr/> 199.5	<hr/> 191.3	<hr/> 8.2 (+)
<i>Capital Expenditures</i>			
Air Services	64.6	63.1	1.5 (+)
Canal Services	2.8	2.7	.1 (+)
Marine Services	25.1	27.0	1.9 (—)
Railway and Steamship Services	2.4	.4	2.0 (+)
	<hr/> 94.9	<hr/> 93.2	<hr/> 1.7 (+)
TOTAL DEPARTMENTAL EXPENDITURES	<hr/> 294.4	<hr/> 284.5	<hr/> 9.9 (+)
<i>Revenues</i>			
Air Services	12.5	11.1	1.4 (+)
Canal Services .....	.4	1.7	1.3 (—)
Marine Services	4.4	2.2	2.2 (+)
Railway and Steamship Services .....	.6	1.8	1.2 (—)
	<hr/> 17.9	<hr/> 16.8	<hr/> 1.1 (+)
<i>Miscellaneous Services</i>			
(1) Preliminary expenses recovered from the St. Lawrence Seaway Authority	1.6	—	1.6 (+)
(2) Interest—St. Lawrence Seaway Authority Loan	5.0	—	5.0 (+)
	<hr/> 6.6	<hr/> —	<hr/> 6.6 (+)
TOTAL DEPARTMENTAL REVENUES	<hr/> 24.5	<hr/> 16.8	<hr/> 7.7 (+)

EXPLANATION OF INCREASES AND DECREASES

Administration, Operation and Maintenance Expenditures

Departmental Administration

An expanding public demand for marine and air services has resulted in increased activities, with a resulting additional administrative expenditure.

Air Services

In order to keep pace with the requirements of the air transportation industry and the travelling public, the services of the Civil Aviation, Telecommunications and Electronics, and Meteorological Branches have been increased. Therefore, costs have risen accordingly.

Canal Services

On April 1, 1959, the St. Lawrence Seaway Authority took over the operations of the Welland and other main line canals. This has resulted in the decreased expenditures as shown.

Marine Services

The development of Canada's northland has created an increased demand for northern transportation. The increased expenditures has resulted from this increased activity.

Railway and Steamship Services

The total expenditures for these services fluctuate annually as a result of the C.N.R. operating deficit. The deficit for the year ended December 31, 1959, was \$43.5 million, which was an \$8.0 million reduction compared with the previous year.

Miscellaneous Services

During 1959-60, the Board of Transport Commissioners for Canada made statutory contributions to Canadian railways in order to compensate the railways for freight rate reductions, thus increasing the expenditures.

Capital Expenditures

Air Services

This increase has resulted from expenditures by the Telecommunications and Electronics Branch for the installation of the Decca Navigation Chains in Eastern Canada and continuing equipment expenditures by the Meteorological Branch at northern stations.

Canal Services

With the taking over of the main line canals by the St. Lawrence Seaway Authority, the Department had no capital expenditures for them in 1959-60. However, an \$0.8 million expenditure was made for the Canso Canal. The net result of the above was a \$0.1 million increase over the previous year.

Marine Services

The decrease is due to the curtailment of the Marine Service steamers ship-building program. However, increased expenditures were made for the dredging of the River St. Lawrence Ship Channel. Therefore, the net decrease was \$1.9 million.

Railway and Steamship Services

The department has continued its program of providing improved auto-ferry services for the Atlantic Provinces, and harbour facilities for the Newfoundland coastal services.

Revenues

Air Services

Increased activity and the Department's efforts to develop all possible sources of revenues at airports has resulted in increased landing fees, rentals and concession revenues for the Civil Aviation Branch. The Telecommunications and Electronics Branch has also increased its rental and licence fee revenues.

Canal Services

In April, 1959, the St. Lawrence Seaway Authority commenced operating a number of the revenue-producing canals previously operated by the Department. Therefore, the Department's canal revenues have decreased in comparison with previous years.

Marine Services

The increase in the tonnage handled by the Northern Transportation Division has resulted in increased revenues.

Railway and Steamship Services

In 1958-59, the Province of Nova Scotia paid the Federal Government \$1.5 million for the Province's share of the cost of the M.V. *Bluenose*. There was no similar revenue in 1959-60.

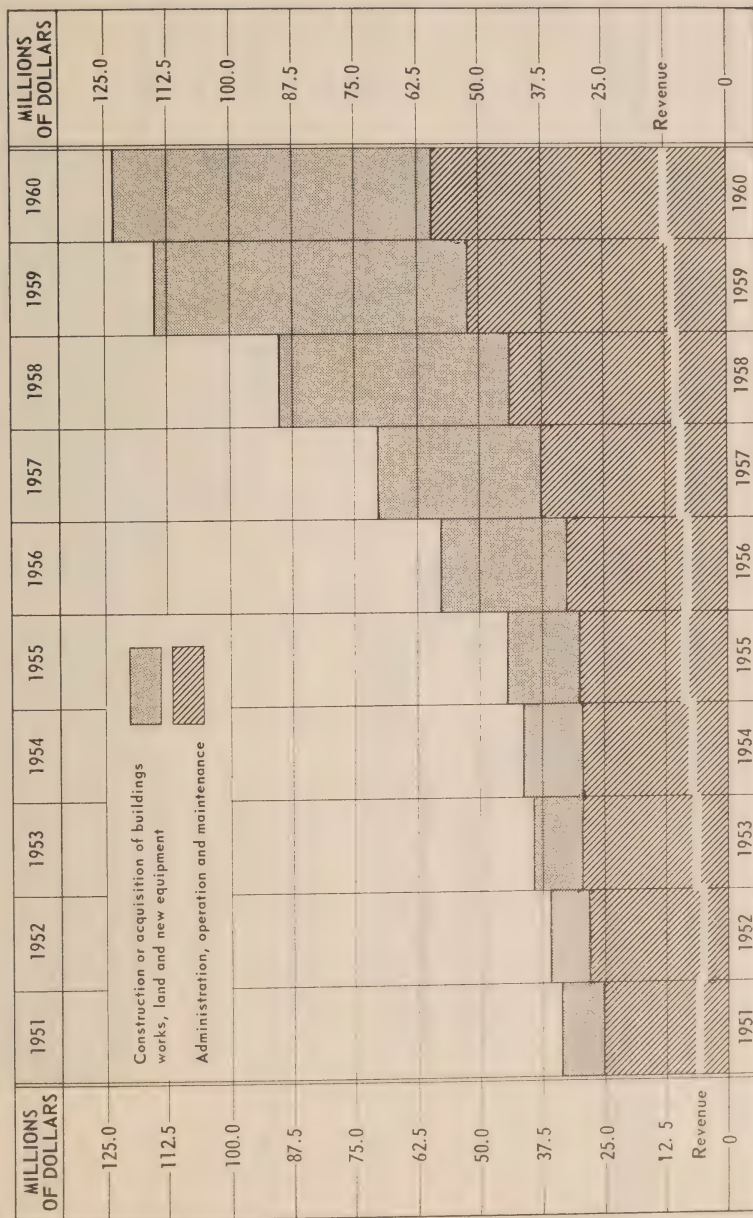
Miscellaneous Services

In 1959-60, the St. Lawrence Seaway Authority reimbursed the Department for expenditures incurred from April 1952 to March 1955 by the Special Projects Branch of the Department.

The St. Lawrence Seaway Authority made its first payment to the Department for interest on loans advanced by the Government of Canada.

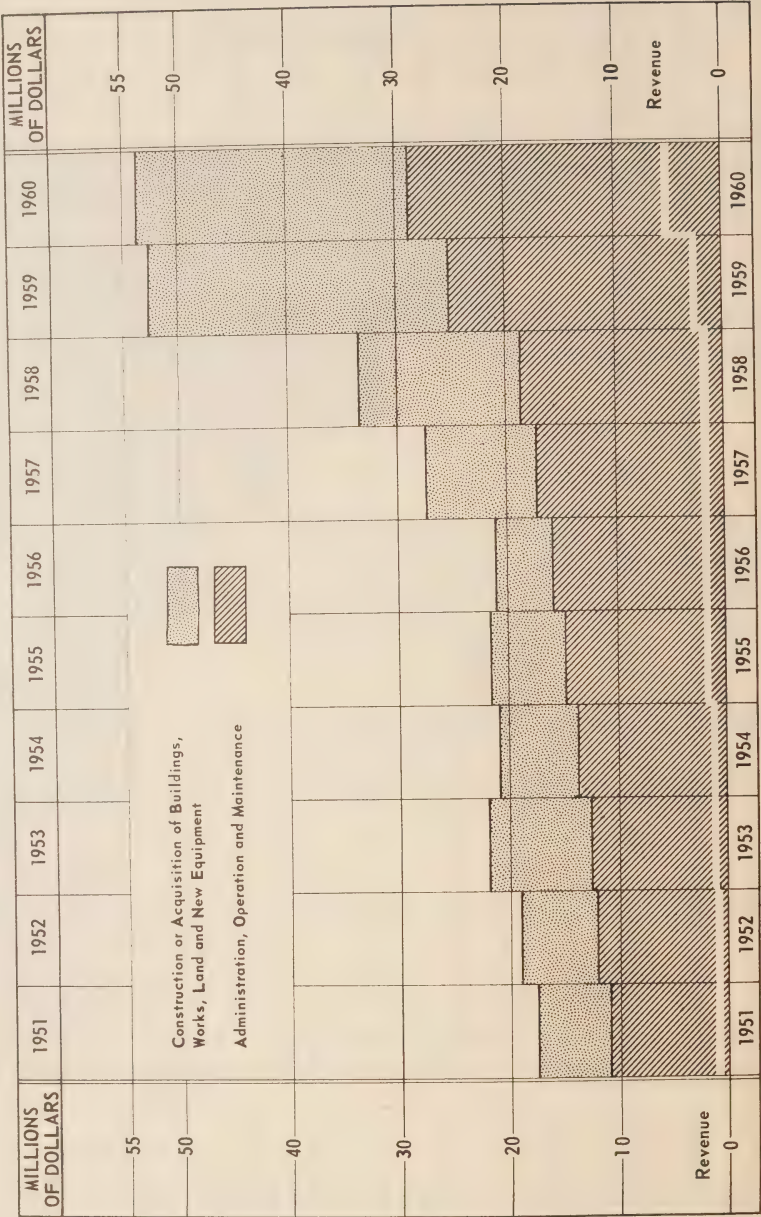
AIR SERVICES

EXPENDITURES AND REVENUES FOR THE FISCAL YEARS 1950-51 TO 1959-60 INCLUSIVE



DEPARTMENT OF TRANSPORT

MARINE SERVICES REVENUES AND EXPENDITURES
FOR THE FISCAL YEARS 1950-51 TO 1959-60 INCLUSIVE



MISCELLANEOUS SERVICES - EXPENDITURES
FOR THE FISCAL YEARS 1950-51 TO 1959-60 INCLUSIVE

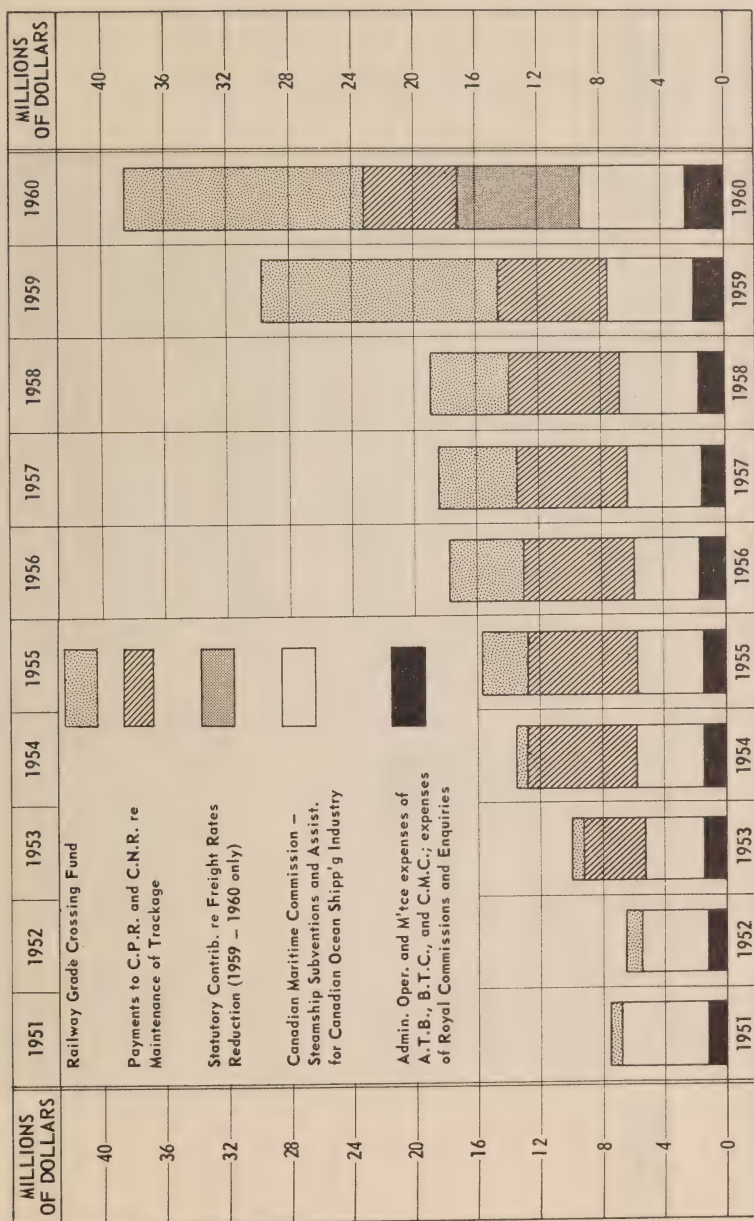
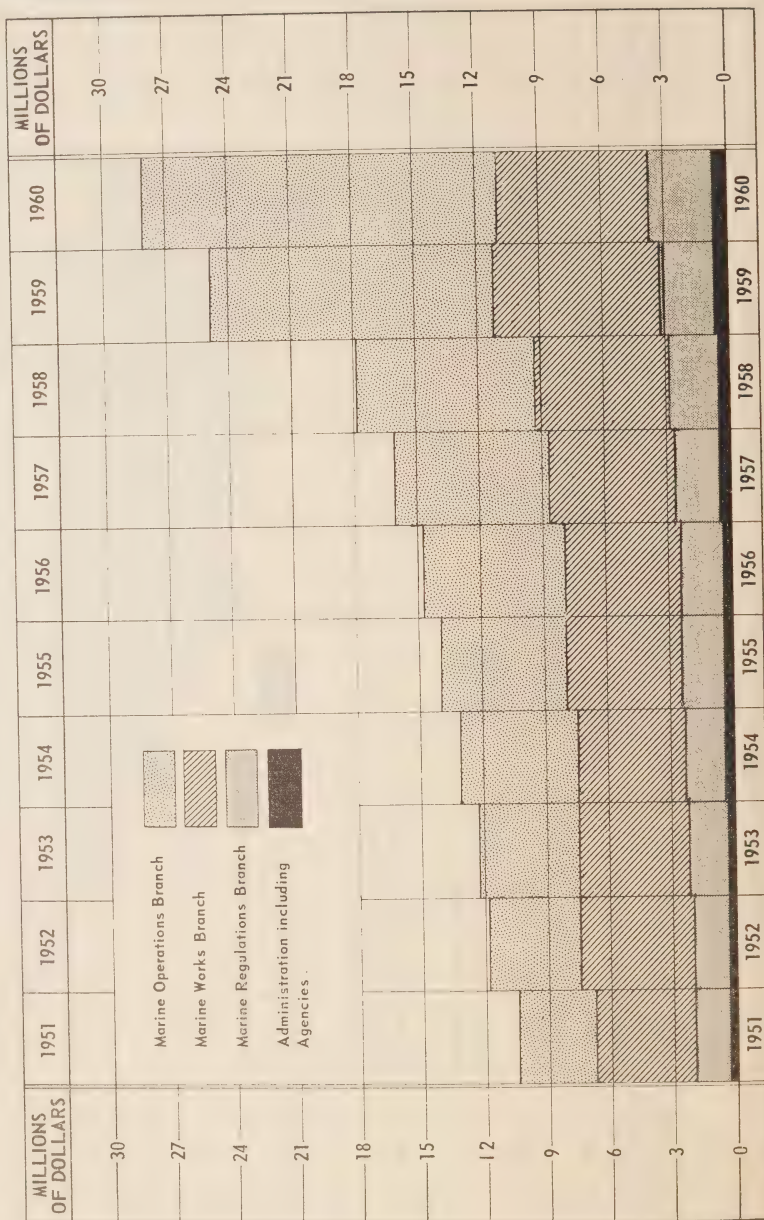
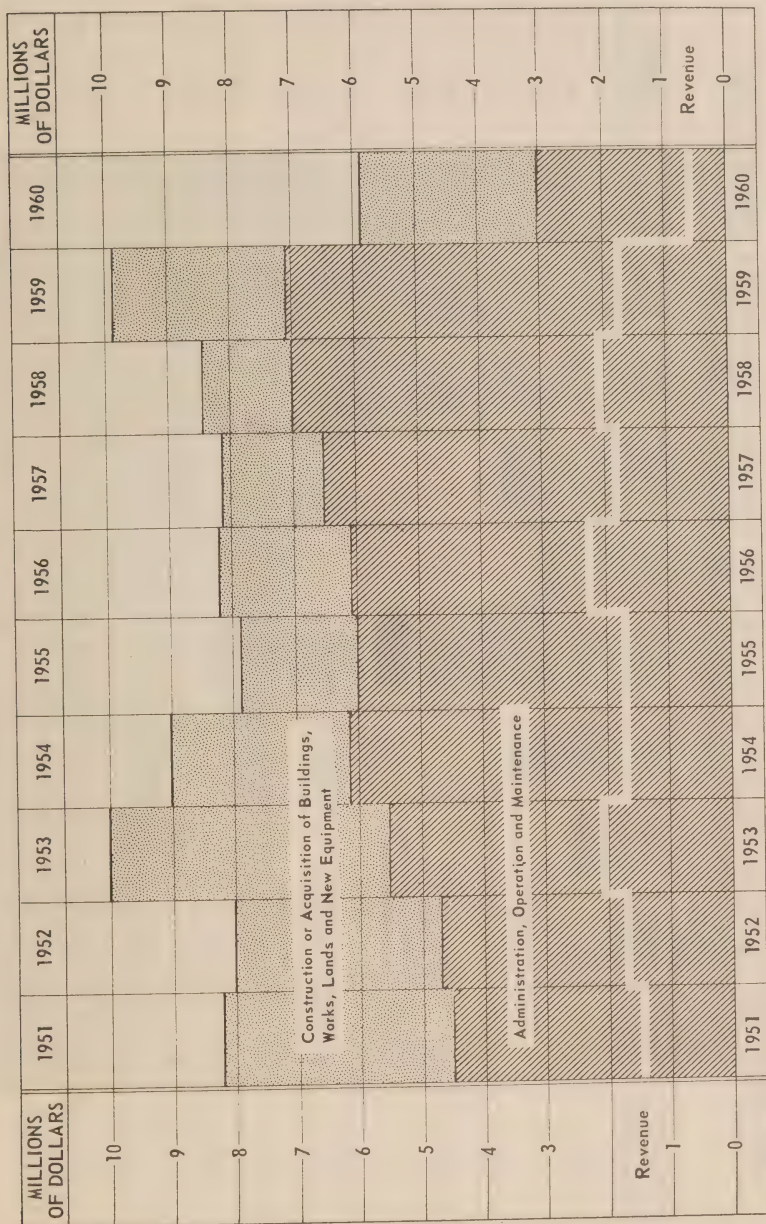


Chart prepared by Financial Division

DEPARTMENT OF TRANSPORT

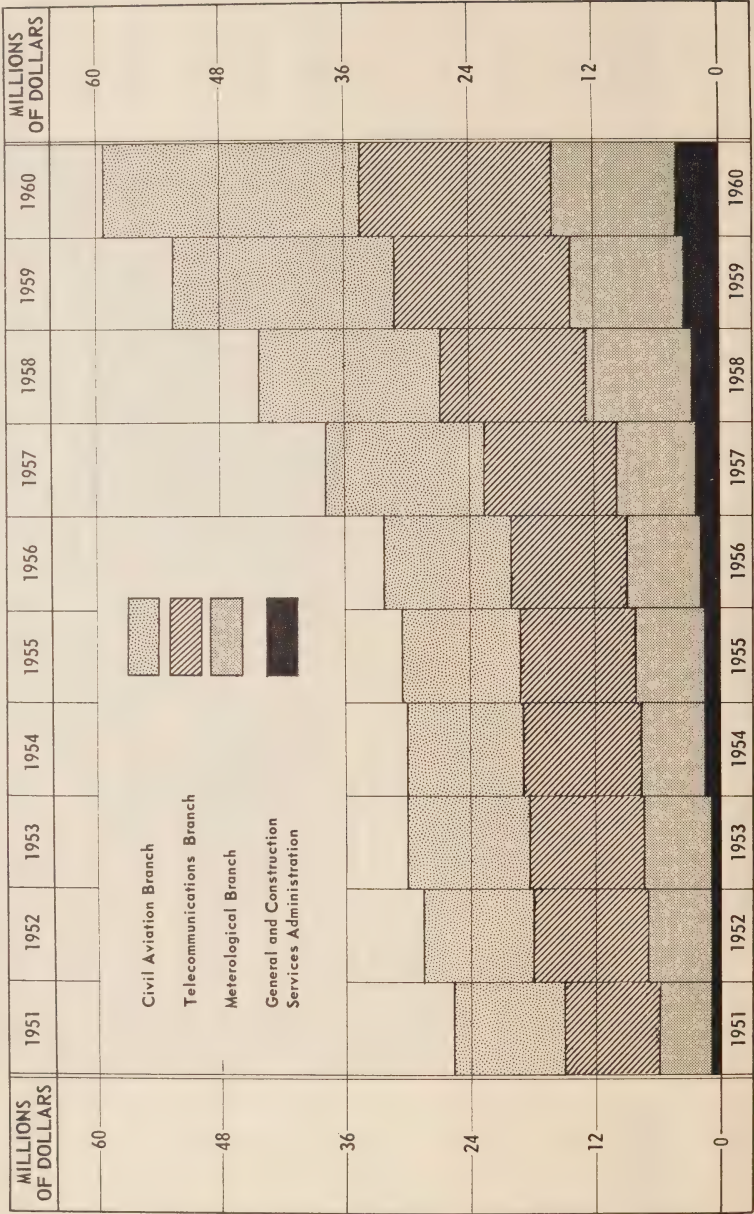
MARINE SERVICES - ADMINISTRATION OPERATION AND MAINTENANCE EXPENDITURES
FOR THE FISCAL YEARS 1950-51 TO 1959-60 INCLUSIVE

CANAL SERVICES REVENUES AND EXPENDITURES FOR THE FISCAL YEARS 1950-51 TO 1959-60 INCLUSIVE



DEPARTMENT OF TRANSPORT

AIR SERVICES - ADMINISTRATION OPERATION AND MAINTENANCE EXPENDITURES
FOR THE FISCAL YEARS 1950-51 TO 1959-60 INCLUSIVE



RAILWAY AND STEAMSHIP SERVICES

EXPENDITURES FOR THE FISCAL YEARS 1950-51 TO 1959-60 INCLUSIVE

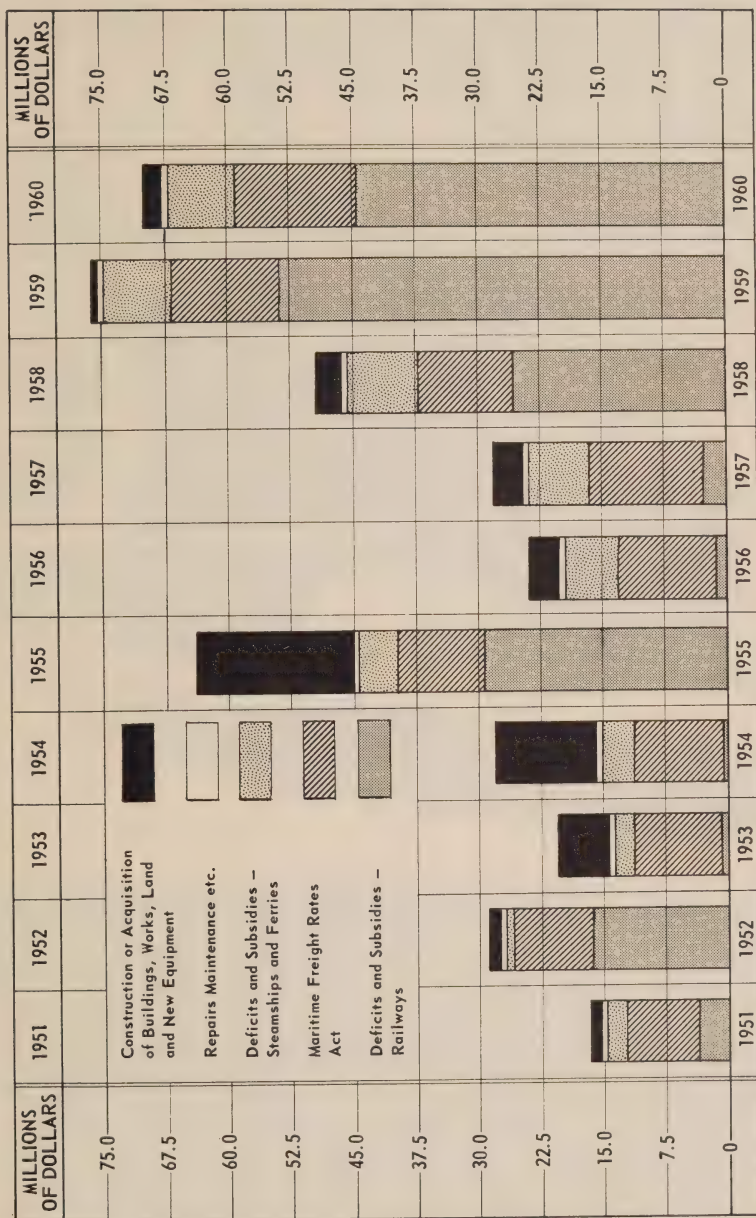
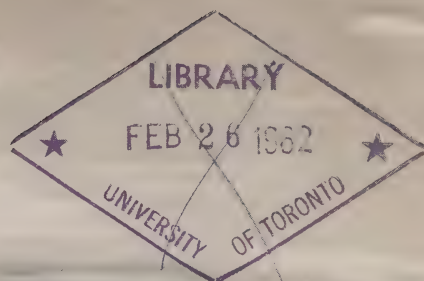


Chart Prepared by Financial Division



ANNUAL REPORT

Fiscal Year ended March 31, 1961

DEPARTMENT OF TRANSPORT
OTTAWA, CANADA

ANNUAL REPORT
Department of Transport

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CANADA

DEPARTMENT OF TRANSPORT

ANNUAL REPORT

FOR THE FISCAL YEAR ENDED

MARCH 31

1960/1961

Submitted Under the Provisions of the
DEPARTMENT OF TRANSPORT ACT

ROGER DUHAMEL, F.R.S.C.
QUEEN'S PRINTER AND CONTROLLER OF STATIONERY
OTTAWA, 1962



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*To His Excellency Major-General Georges P. Vanier, D.S.O., M.C., C.D.
Governor General and Commander-in-Chief of Canada.*

MAY IT PLEASE YOUR EXCELLENCY:

The undersigned has the honour to present to Your Excellency the Annual Report of the Department of Transport, for the fiscal year ended March 31, 1961.

LEON BALCER, Q.C.,
Minister of Transport.

MINISTRY OF TRANSPORT

MINISTER

BOARDS, COMMISSIONS AND GOVERNMENT-OWNED COMPANIES

Air Transport Board
Board of Transport Commissioners
Canadian Maritime Commission
Canadian National Railways
Canadian National (West Indies) SS. Co.
Canadian Government Merchant Marine, Ltd.
Canadian Overseas Telecommunication Corporation
National Harbours Board
St. Lawrence Seaway Authority
Steamship Inspection Board
Trans-Canada Air Lines

ACTS ADMINISTERED BY THE DEPARTMENT OF TRANSPORT

GENERAL

Bills of Lading Act
Canadian Overseas Telecommunication Corporation Act
Department of Transport Act
Pipelines Act
St. Lawrence Seaway Authority Act
Telegraph Act
Transport Act

AIR SERVICES

Aeronautics Act
Carriage of Goods by Air Act
Foreign Aircraft Third Party Damage
Radio Act

MARINE

Belleville Harbour Commissioners Act
Canada Shipping Act
Canadian Maritime Commission Act
Canadian National Steamships Act
Government Harbours and Piers Act
Government Vessels Discipline Act
Hamilton Harbour Commissioners Act
Lakehead Harbour Commissioners Act
Live Stock Shipping
Nanaimo Harbour Commissioners Act
National Harbours Board Act

Navigable Waters' Protection Act
New Westminster Harbour Commissioners Act
North Fraser Harbour Commissioners Act
Oshawa Harbour Commissioners Act
Port Alberni Harbour Commissioners Act
Toronto Harbour Commissioners Act
Water Carriage of Goods Act
Windsor Harbour Commissioners Act
Winnipeg and St. Boniface Harbour Commissioners Act

RAILWAYS

Canadian National Railways Act
Canadian National-Canadian Pacific Act
Canadian National Railways Financing and Guarantee Act
Canadian National Montreal Terminals Act
Canadian National Railways Pensions Act
Canadian National Toronto Terminals Act
Government Railways Act
Intercolonial Railway and P.E.I. Railway Employees Provident Fund Act
Maritime Freight Rates Act
Railway Act



Montreal International Air Terminal

AIR SERVICES

General

The year under review marked a substantial increase in the number of larger and faster type jet aircraft being operated by both domestic and international airlines using Canadian airports and facilities.

The resultant major civil aviation activities throughout Canada have meant careful studying and planning to ensure that appropriate services and control are provided in the development and operation of airports, air traffic control, communications and navigational facilities, meteorological services and adequate and proper regulatory procedures in all areas, as well as long-range planning.

Close liaison was maintained with other government departments, as well as the International Civil Aviation Organization and the United States Federal Aviation Agency.

Training

The Air Services training school at Ottawa Airport completed training courses for 58 students in air traffic control, 104 meteorological technicians, 120 radio operators, 69 radio technicians, and 33 radio inspectors.

A new frequency standard and associated monitoring equipment were installed at the school for training new personnel entering the Monitoring Service.

Eleven students were graduated in the M.A. course in meteorology given in co-operation with the University of Toronto in May, and 18 were enrolled in the course at the end of the year, one of whom was a meteorologist from the Philippines on an ICAO scholarship.

Twenty-five students were enrolled in the seventeenth meteorological officers course given from June to December.

Two refresher courses were given during January, February and March for fifteen meteorological officers and fifteen meteorologists. Advanced practical training and forecast training courses were provided for newly-graduated recruits.

A correspondence course, *Vector Analysis for Meteorologists*, was in progress at the end of the year, with seventeen field meteorologists enrolled.

Four radiosonde training courses, each of approximately three months' duration, were completed at the Meteorological Field Station, Scarborough. Of 72 students attending, 50 were graduated.

The fourth ice observer course was completed in March, and included both lectures and practical training, as well as instructional flights.

Pilot training for Headquarters and Regional pilots is carried out throughout the year, and at Ottawa training was provided to 52 pilots. This training consisted of float and multi-engine endorsement, check-out on type, and *ab initio* and advanced instrument training. Five pilots received *ab initio* helicopter training. A total of 1,386 hours was logged on the Flight Simulator, most of which was routine training with emphasis on Instrument Landing (ILS) and omni procedures. Three RCMP pilots received Class I Instrument Rating courses, and four received training to First Officer status.

Two flying instructor refresher courses were again sponsored by the Department, managed jointly by the Royal Canadian Flying Clubs Association and the Air Industries and Transport Association. A total of 60 instructors were graduated from these courses which are designed to maintain a high standard of pilot training.

Of the 4,014 private pilots licensed, 3,031 were trained under the Department's assistance plan. Forty flying clubs and 70 flying schools approved by the Department participated in the training program.

Aviation personnel licences in force at the end of March were as follows: pilots: glider, 451, private, 14,897, commercial, 2,220, senior commercial, 435, airline transport, 1,254; air navigator, 94; air traffic controllers, 771; flight engineers, 54; aircraft maintenance engineers, 1,971.

Airports

To meet the demands of continuing increases in all-up weight of the large jet air transports, the introduction of Vickers Vanguard aircraft into scheduled airline service and the operation of other turboprop aircraft at smaller airports, plans were developed for the extension and strengthening of runways, taxiways and parking ramps at Moncton, Quebec, Montreal, Toronto, Winnipeg, Calgary, Abbotsford, Vancouver, and Victoria, and new runways for jet operations were planned for Montreal and Calgary.

Treasury Board approval in principle was received for the expansion of airports at Saint John and Moncton, N.B.; Knob Lake, Roberval, Quebec City, and Montreal, Que.; Toronto and Toronto Island, Ont.; Winnipeg and Winnipeg secondary airport, Man.; Saskatoon, Sask.; Calgary, Alta.; and Vancouver and Victoria, B.C.

Grants-in-aid totalling \$60,272 were paid for further development of an airport at Lourdes du Blanc Sablon, Que., and at Lytton, B.C. A cost-sharing

grant of \$24,084 was made to the villages of Gibson's Landing and Sechelt, B.C., for an airport on the Sechelt Peninsula. Further cost-sharing assistance amounting to \$5,056 was provided for the development of an airport to serve the mining area at Rankin Inlet, N.W.T.

Airports taken over for operation during the year were Edmonton and Halifax International, Williams Lake, Cambridge Bay and Inuvik.

During the year 88 airport licences were issued and 497 were in force at the end of the fiscal year.

Operational Requirements—The study of aircraft noise abatement was continued and additional measures have been taken to reduce the effect upon the airport community. At Montreal, aircraft operations have been restricted between midnight and 7 a.m., equipment has been purchased for the provision of a mobile noise monitoring station, and a radio marker has been installed to assist aircraft crews in carrying out effective noise abatement take-off procedures when using runway 24L. The National Research Council on behalf of the Department has conducted additional studies of aircraft noise and its effect upon residential areas.

An operational evaluation of two types of flush runway lighting units was conducted at Ottawa during the winter. Development of a unit that will suitably meet the requirement of Canadian winters was undertaken, as existing units are not practical for Canadian conditions. A visual glide slope indicator of the Royal Aeronautical Establishment design has been installed to serve runway 06R at Montreal. If this proves satisfactory, it is expected additional units will be installed at other Canadian airports where an operational requirement exists.

A number of changes in airway structures were made to provide better links between centres which are growing in population and importance. The number of designated danger areas was considerably reduced and plans were made to eliminate "prohibited" airspace in Canada except in lower levels over penitentiaries and certain other locations.

Development—Work on new airport sites was completed at Halifax, St. Joseph d'Alma, Que., Edmonton, Prince Rupert, and Inuvik, and development continued at Three Rivers and Sherbrooke, Que., and Sault Ste. Marie, Ont.

Contracts were awarded for the development of new airports at Flin Flon, Man., Charlevoix (La Malbaie), Que., and Toronto Island.

Contracts were awarded and progress made in landscaping at Montreal, Ottawa, and Halifax airports, and landscaping was planned for Toronto, Winnipeg, and Edmonton.

Projects for the Department of National Defence, consisting of runway construction, lengthening and extending existing facilities and providing taxiways and parking aprons, were under development or completed at Cartierville, North Bay, Cold Lake and Namao, Alta., and Frobisher, N.W.T.

Major Terminals—New terminals at Montreal, Ottawa, Halifax and Regina were completed and officially opened during the year.

A general contract for Aeroquay No. 1 was awarded in September for the Toronto terminal project, and the administration building and control tower were in the planning stage.

At Edmonton, major contracts awarded in May for a services building and a foundation and structural reinforced concrete ground-floor slab were almost completed by the end of the fiscal year. The structural steel contract awarded in September is progressing satisfactorily, and tenders for the general building are being called in 1961.

Contracts for excavations, site preparation, structural steel and a power house for the Winnipeg terminal project were awarded, and work proceeded on schedule.

Standard Terminal and General Buildings—A new terminal was completed at Williams Lake, B.C., and a contract let for the Prince Rupert terminal. Drawings were completed for terminals at Inuvik and Port Hardy.

Plans and specifications were prepared for terminals at North Bay and Sault Ste. Marie, and initial planning was under way for terminals at Fort McMurray, Alta., and Penticton and Victoria, B.C.

Temporary terminals were constructed at Sault Ste. Marie and Prince Rupert to accommodate air traffic until new buildings are completed.

To improve terminal facilities at Lakehead, plans were prepared for additions to the existing terminal, and the conversion of a hangar for Whitehorse was in the planning stage.

Major projects completed were: 21 double dwellings and one single men's living quarters at Goose Airport; a foundation contract for the central heating plant at Montreal; one double dwelling and two-car garage at Port Menier, Que.; extension to the air terminal at Seven Islands, Que.; equipment garage, a standard laboratory building and electric power plant at Ottawa; addition to an apartment and a two-car garage at Fort Churchill; hydrogen building, warehouse, maintenance garage, power house, boiler house and various radio buildings at Inuvik; an airport services building at Vancouver; and five double staff dwellings at Williams Lake. Similar projects were under way at sixteen other sites.

Power and Lighting—Airport lighting facilities were under construction at sixteen sites, and the establishment of power facilities was in process at 12 locations.

Maintenance—As a result of improved methods and equipment, combined with experience, non-operating winter conditions were few and of a short duration. For ground operation of jet-powered aircraft, runway and taxi surfaces must be clean, with the pavement free of snow and debris of any kind and carried out in the least possible time. To assist this function, a high-speed blower has been developed and four of these units have been undergoing operation tests and modifications in collaboration with the RCAF.

Weed and brush control also presents an airport maintenance problem, not only in the interests of fire prevention, but also to combat the spread of obnoxious weeds. In co-operation with the Department of Agriculture through the National Weed Control Committee, control tests are being carried out at six airports across the country, representing each Air Services Region and most of the problem growth.

During the year 136 pieces of major airport equipment, such as trucks, snowblowers and sweepers, were purchased either as a replacement for worn-out

equipment or to handle increased maintenance requirements. New types of equipment or modifications to existing equipment are constantly being tested to improve snow removal and other phases of operation and maintenance.

Fire Services—Emphasis on the promotion of fire prevention has contributed materially to the reduction of fire losses. In 1960, losses totalled \$77,956, compared with \$264,113 in 1958 and \$96,975 in 1959.

Automatic fire detection systems are installed in new terminal buildings, remote and unattended radio buildings, equipment garages and hangars in conjunction with new construction and renovations of existing buildings. The Fire Services Organization is being strengthened by the appointment of a Fire Marshal and staff and fire prevention officers for each Region.

Airport Operation Revenues—Revenues totalled \$11,384,755, compared with \$9,377,040 the previous year. This increase resulted from the introduction of the air route facilities fee, the introduction of larger aircraft, concessions in the new terminals, and the operation of parking lots.

Air Traffic Control

Three new airport traffic control towers were added—Halifax, Edmonton, and Fredericton—making a total of 31 operated by the Department. Aircraft movements controlled by the towers totalled 2,823,470, a decrease of 7 per cent from the previous year.

An additional terminal control unit was added at Halifax in 1960, bringing the number operating to 15. These units provide separation to aircraft in accordance with the Instrument Flight Rules within specified areas, usually within a 30 or 40-mile radius of the airport.

The eight area control centres handled 2,882,757 fix postings, 728,425 IFR (Instrument Flight Rules) flight plans, and 225,594 VFR (Visual Flight Rules) flight plans, a decrease of 5, 9 and 1 per cent, respectively, from the previous year.

Aircraft

Civil aircraft registrations increased, commercial aircraft totalling 1,864; private, 3,358; and State, 207, compared with 1,847, 2,869, and 198, respectively, the previous year.

Air Regulations

Investigations of Air Regulations infractions resulted in 94 successful prosecutions as compared with 53 in 1959.

Aircraft Accidents

In the 331 accidents involving Canadian registered civil aircraft during 1960, there were 57 fatalities, 34 less than the previous year. There were no fatalities or injuries in scheduled operations. The ratio of accidents to the number of commercial aircraft registered increased by 1.22 per cent.

Air Carriers

Of the 565 commercial air carriers operating the various types of commercial air services in Canada at the end of the year, 331 were Canadian and 224 Foreign and Commonwealth.

Flight Operations

At the end of the fiscal year, the Department was operating 36 fixed-wing aircraft and 17 Bell 47 helicopters. During the year an order was placed for a Sikorsky S-62 turbine-powered helicopter, which will be operated for the district marine agents at Prince Rupert and Victoria and used mainly for the resupply of lighthouses on the West Coast.

Delivery of the Jet Star ordered last year is expected in November, 1961. This aircraft will be used to familiarize departmental pilots with all phases of jet aircraft operation and to provide for additional evaluation of radio aid characteristics at high altitudes as well as high-speed transportation.

At the aircraft maintenance and overhaul base at Ottawa airport, there were 62 engine changes, 13 overhauls of fixed-wing aircraft and nine complete overhauls on helicopters, in addition to the day-to-day maintenance requirements of aircraft operating from the Ottawa base.

Aeronautical Engineering

During the year four new aircraft type approvals were issued and a number were revised to cover changes in the aircraft configuration.

In connection with technical supervision over all civil aircraft operators and manufacturers, 3,101 aircraft inspections and 1,070 visits were made to various organizations.

Air Engineer examinations held totalled 731.

The Canadian Airworthiness Council, under the chairmanship of the Chief Aeronautical Engineer, met three times and made recommendations for changes in aircraft inspection, certification, and airworthiness requirements.

Radio and Television

Licensed radio stations in Canada numbered 68,000, an increase of approximately 7,200 over the previous year. This number included stations operated by Federal, Provincial and Municipal government departments, stations on ships and aircraft registered in Canada, and mobile stations operating in the public and private land mobile services.

Although the Department has expanded its aids to air navigation facilities, it has been necessary to continue to license companies to establish their own aeronautical navigational and communications aids in remote areas. City Services Oil Company was granted a licence for the only privately-licensed TVOR (Low Power Terminal VOR) facility in Canada.

During the year, 35 applications for unattended operation of broadcasting stations using supervisory control systems were received and approved.

Applications for new private commercial broadcasting station licences totalled 38, of which 32 were for AM sound and six for FM. Sixty applications were received for new private commercial broadcasting stations (television) licences, and 16 for changes in facilities of established private commercial broadcasting stations (television). Twenty-five private commercial broadcasting stations (television) commenced operation.

For smaller centres in Canada located beyond the normal coverage areas or in shadow areas of existing television stations which for varied reasons could not justify the establishment of a normal television rebroadcasting station, the Department introduced a special licence to permit the establishment of low power VHF television rebroadcasting stations with transmitter power not to exceed five watts.

Licence fees collected from private commercial broadcasting station licensees totalled \$710,796.73.

Monitoring Service

The building for the new monitoring station at Montague, P.E.I., was completed early in March. Plans for establishing a station at Fort Smith, N.W.T., were completed and specifications for its construction were drawn up. This station will provide control over radio stations in the northern areas of the prairie provinces, British Columbia and the western parts of the Northwest Territories.

During the past year, emphasis was placed on policing and surveillance, and a total of 5,100 technical and operational violations of the Radio Regulations was reported.

Spectrum scanning programs were carried out by photographic means for the purpose of selecting inactive frequencies which would be suitable for assignment to Canadian stations, and approximately 220 frequencies were recommended for specific types of operation.

Approximately 170,800 feet of magnetic tape recordings of specific programs from selected broadcasting stations were prepared for the Board of Broadcast Governors for review. Two hundred and sixty-four special assignments concerning frequency measurements and the investigation of interference to specific frequencies were completed. Several of the monitoring stations were engaged in supplying climatological reports for the Meteorological Branch.

Radio Spectrum Conservation

A project to evaluate the use of transistor radios in national emergencies was started and 35 transistorized receivers were examined in the laboratory. Some 14 special engineering projects were undertaken by the laboratory staff on various problems related to the technical aspects of spectrum management.

The Systems Engineering Group dealt with approximately 200 engineering briefs covering HF, VHF, UHF and SHF point-to-point radio systems. The large number of systems that have to be licensed is placing heavy demands on the spectrum and much of the work of the group involves the solution of interference problems. Spectrum usage in the microwave bands, in particular, increased to such an extent that a consulting engineering firm was employed to study and report on the compatibility of defence and civilian systems. A pre-licensing procedure was

implemented that will permit co-ordination of microwave systems to resolve problems of interference while systems are in the design stage before licensing action is taken.

Inductive Interference

During the year 20,491 sources of interference were located and suppression was obtained in all but a few cases having no reasonable cure. Of these, 12,167 were power-line faults, 3,263 were commercial and industrial equipment, 2,913 were RF communications equipment, and 1,901 were household apparatus.

Interference caused by television receivers has rapidly declined since agreement was reached several years ago with the Radio-Electronics-Television Manufacturers Association of Canada that its members would suppress all television receivers to a conducted noise level of 100 microvolts. There have been indications, however, that possibly the 100 microvolt level is too high for satisfactory reception of weak standard broadcast signals, especially where there are high concentrations of TV receivers. From examination of new sets from manufacturers as well as sample measurements made in various suburban and urban areas, it is expected that a decision can be reached.

Safety Radio Surveys and Inspections

To ensure compliance with Canadian Law and pertinent International Convention and Treaty, radio inspectors, operating from 29 field offices throughout Canada, conducted surveys and inspections of 24,755 radio stations of various classes. Included in this total were 4,159 surveys and inspections of radio stations installed on Canadian and foreign ships conducted under the provisions of the International Convention for the Safety of Life at Sea, the Canada Shipping Act, and the Canada-U.S. Great Lakes Agreement; a corresponding number of Safety Radio and Radio Inspection Certificates were issued. This is a substantial increase over the previous year and a continuing trend is indicated towards greater use of shipborne communications and navigational aids equipment.

During the year, 2,293 inspections were made of radio-equipped aircraft to ensure compliance with departmental licensing requirements and technical specifications covering installation methods and materials.

Thirty-one breaches of the Radio Act resulted in successful prosecutions. Most of these involved the establishment and operation of unlicensed radio stations.

Examinations

Examinations for certificates of proficiency in radio totalled 7,135, and 6,453 certificates were issued.

Research, Development and Programming

Requirements specifications were approved for a mobile air traffic control tower and for a mobile IFR facility as a companion unit.

An optical airport surveillance runway facility has been developed using closed-circuit television techniques and a microwave link for video transmission.

A system specification has been issued and a pilot system selected. The installation of the facility is scheduled for Toronto International Airport and the project will continue in 1961 with the technical and operational evaluation.

Equipment—An IBM cardatype installation has been installed in the Toronto ATC Centre to produce flight progress strips from flight plans handed into the Centre and two additional installations have been approved.

A site has been selected for the installation of a new surveillance radar in the vicinity of London, Ont. This required long and involved studies, as the location must have access to the trans-Canada microwave system in order to pass the radar data back to the Toronto ATC Centre.

Radio and Radar Aids to Navigation

New Very High Frequency Omni range (VOR) facilities were commissioned at Sydney and Yarmouth, N.S.; Charlottetown, P.E.I., Moncton and Saint John, N.B.; Lakehead, Ont.; Langruth, Man.; Beechy, Sask.; and Vancouver, B.C.; and planning and site testing for a VOR airway through the Rocky Mountains is progressing.

At the request of the Royal Canadian Air Force, 39 TACAN (Tactical Air Navigation) installations were planned, of which 22 will be combined with the Department's VOR facilities.

New Instrument Landing Systems (ILS) were commissioned at Halifax and Edmonton, and commenced or progressed at Moncton, Sept Iles, Montreal, Sault Ste. Marie, Fort St. John, Prince Rupert, Penticton and Abbotsford. Temporary systems were commissioned at Frobisher and Montreal, and new back course markers were provided at Halifax, Montreal and Saskatoon. Systems were relocated at Montreal, Regina and Lethbridge, and new sites were selected for relocation of facilities at Winnipeg, Calgary and Vancouver.

A precision approach radar was installed at Toronto International Airport, and a new type of antenna system was installed on the unit at Gander.

At Regina and Montreal, aeradio, IFR and control tower facilities were renovated and transferred to the new terminal buildings, and aeradio and control tower facilities were renovated and transferred to the new terminal building at Halifax.

Long range surveillance radar was installed at Halifax and Edmonton International Airports, completing the original program for 15 such installations, and installation of secondary radar (air traffic control radar beacon systems) at all surveillance radar sites is under study.

Specifications were prepared and tenders called for seven systems of radar-to-television scan conversion equipment for use in air traffic control centres.

At Inuvik, N.W.T., a new remote receiver site and VHF/NDB transmitter building were completed, and new transmitting facilities will be installed during the summer of 1961.

A new transmitter and receiver site, and a new operations building were completed at Cambridge Bay, N.W.T., and an air-operational radioteletype circuit went into operation between Cambridge Bay and Resolute.

The first installation of automatic error correcting equipment was made on the radioteletype circuit between Churchill, Man., and Coral Harbour, N.W.T. Two channels are now available over the system with a reliability in excess of 98 per cent.

Extended range VHF installations were completed at Goose, Lab., and Winnipeg, and further antenna improvements are planned to extend the range to 350 nautical miles during 1961.

Radio ranges at Abbotsford and Kimberley, B.C., were converted to simultaneous operation, but no new radio ranges were commissioned.

Beacon and air-ground communication facilities of the former Royal Canadian Corps of Signals stations in the Yukon and Northwest Territories were considerably improved.

The aeradio and marine facilities at both St. John's, Nfld., and Montreal were combined into single establishments at the respective airports, and a combined marine/aeradio beacon was commissioned at Ramea, Nfld. The Father Point marine radio station was closed and combined with the aeradio station at Mont Joli. The aeronautical radiobeacon at Ethelda Bay, B.C., is now operated as a combined marine aeronautical radiobeacon and the Pachena Point radiobeacon was closed.

Radio beacons were commissioned at Pinehurst, N.S.; Nicman (Sept Isles), Que.; Sibley, Oshawa, and Kakabeka, Ont.; Beechy, Hague, Blucher and Donavon, Sask.; Rocky Mountain House and Barchane, Alta.; and Smithers and Enderby, B.C.; and under construction at 27 sites. Plans and specifications were completed for the rehabilitation of the Cape St. James, B.C., radio beacon station.

The marine radio beacon at Gibraltar Point, Ont., was converted to a combined facility, and new marine radio beacons were under construction at six sites.

Plans and specifications were completed for the relocation of the Resolution Island, N.W.T., coast station, and for the addition of a combined radio beacon facility, and coast station facilities were provided at Charlottetown, P.E.I., to serve the fishing fleets in the surrounding area.

The Quebec Decca Chain was decommissioned and its relocation planned to cover the Gulf of St. Lawrence and the St. Lawrence River up to the Saguenay. New sites were selected and building construction started, and specifications were issued covering the removal of the electronic equipment to storage and for the construction of 300-foot vertical radiators using a new method of top loading to obtain high efficiency.

The relocation of the West Newfoundland Chain was planned and sites chosen to provide a good link-up with other Decca Chains and to provide first-class coverage in the Cabot Strait.

The direction finding service at Bell Isle, Cape Race, Camperdown, Canso, Yarmouth, and Saint John were discontinued.

A lighthouse radiophone was established at East Ironbound Is., N.S.

A new harbour surveillance radar installation for Camperdown, N.S., was designed, specifications prepared and tenders called for the equipment.

New radar equipment was purchased and installed on CMS *Labrador* and *Tupper*, and tenders called for similar installations on several other CMS ships.

Landlines

Many miles of landline teletype circuitry were added during the year, including a circuit commissioned between Cambridge Bay, N.W.T. and Anchorage, Alaska, and another between Mayo, Dawson and Whitehorse, Y.T.

Progress was made in increasing the speed of all air-operational landline teletype circuits to 75 w.p.m., and in having all stations forming a part of airops teletype circuits changed from manual to automatic sending.

Government Telegraph and Telephone Services

Lines remaining in Cape Breton were sold to the Maritime Telegraph and Telephone Company, effective at the close of the fiscal year, and on the Magdalen Islands to the Telecommunications des Iles-de-la-Madeleine Company, effective November 1, 1960.

Facilities remaining consist of six small radio-telephone stations along the Labrador coast, and about six miles of submarine cables in various locations along the Nova Scotia coast by which service is extended to off-shore islands.

Message Centre Operations

Teletype and commercial telegram messages handled by the Centre totalled 75,561.

Telex equipment was installed in late November, providing the Department with service over the commercial telex system.

Revenue

Total Telecommunications revenue from all sources totalled \$3,883,745.74.

Emergency National Telecommunications Organization

On April 26, 1960, the Cabinet gave approval to the formation of the Emergency National Telecommunications Organization under the control of the Minister of Transport. Its function is to ensure that the Government as a whole, its various agencies, and private users with essential wartime functions will make the best possible use of the country's telecommunications services and facilities in preparation for, during, and after a national emergency. It will exist in nucleus form in peacetime as a planning agency, and in wartime will function as the executive agency of Government in controlling and administering the national telecommunications systems, involving radio and television broadcasting.

During the year the Interdepartmental Emergency Telecommunications Committee was formed and held two meetings. Groups were set up to study and make recommendations on matters concerning telecommunications vital points; priorities for restoration, allocation and use of communications circuits and services; broadcasting; control of radio emissions in wartime; and communications requirements.

Meteorological Services

Eleven principal forecast offices provided the basic public and aviation forecasts issued in Canada for civilian and military requirements. This is two less than the previous year as a result of the amalgamation of the Dorval Dominion Public Weather Office and the Montreal Aviation Forecast Office, and of the Halifax Dominion Public Weather Office and the Moncton District Aviation Forecast Office at Halifax.

Forecasts, widely distributed through the medium of the press, radio and television, were issued four times daily for each of 77 inland regions throughout Canada, and describing weather elements of particular interest to mariners three times daily for 41 marine areas. Separate forecasts were also provided regularly for 23 Canadian cities. General forecasts were supplemented by specially prepared forecast advice to agriculture, forestry, industrial and government interests.

Shipping operations in ice-infested waters in the Gulf of St. Lawrence, Cabot Strait, Strait of Belle Isle, Newfoundland coastal waters, Hudson Bay, Hudson Strait and Arctic areas where shipping is engaged in the annual resupply of weather stations and DEW Line sites were provided with ice forecasts and advisory services.

Weather advisories were issued when the threat of severe weather conditions existed and warnings were issued when such hazardous conditions as freezing rain, heavy snow or rain, blizzards, gales and severe cold were expected to endanger life and property.

Late spring and early fall frost warning services were provided for fruit growers in the Okanagan, Niagara and Annapolis areas, and fruit, vegetable and tobacco growers in southwestern Ontario were provided with special advisory services during critical growing periods.

Television weather programs were a regular feature on most TV stations and to assist in providing accurate weather information, special weather synopses were prepared. In addition, weather advice was provided to radio and TV stations, and to the press by local Weather Offices.

The Arctic Forecast Office in Edmonton prepared a summary of weather in northern areas for inclusion in the daily CBC program directed to Arctic residents.

Weather Information—Public interest in weather subjects steadily increased and wherever possible, pertinent publications were supplied in answer to queries, and new leaflets were prepared to provide information on particularly popular weather topics.

With the introduction of meteorology in the curricula of the higher grades in primary school as well as in secondary school programs, there was an increasing demand for publications designed to assist in teaching meteorology.

Staff members assisted in the instruction of organizations whose studies included meteorology and addressed service clubs, scientific organizations and church groups on meteorological topics.

Expanded Services

Two new weather offices were opened—one at Fredericton, N.B., and the other at London, Ont.

Plans were completed for new forecast regions and regional boundaries in Eastern Canada to provide more accurate and detailed forecast service in this area.

An agrologist from Macdonald College worked in the Montreal Forecast Office on an experimental basis to provide special weather service and advice to agriculturists in the province, and a similar program was undertaken by an agrologist from the Saskatchewan Department of Agriculture, who was assigned to the Regina Forecast Office to prepare special weather bulletins for Saskatchewan farmers during the end of the 1960 growing season.

Aviation Weather Service

Agreement was reached with the United States Weather Bureau on an exchange of area forecasts for high-level and long-range aviation, which will minimize duplication in serving over-lapping route patterns emanating from Canada and the United States.

In co-ordination with the Civil Aviation Branch, plans are being developed for reporting cloud height and visibility at the approach end of instrument runways at certain major airports, using remote-reading instruments.

Increasing requirements are indicated for more precise and detailed observations of weather elements affecting landing, accurate short-period landing forecasts, and improved dissemination of information on significant enroute weather, especially for the increasing number of small aircraft.

Weather Maps

After thorough study it was decided to change the projection used for weather maps from Lambert conformal conic standard at 30° and 60° N. to the polar stereographic projection standard at 60° N. This was necessary because of the increasing commitments for meteorological service in polar regions. To accommodate additional traffic on the National weatherfax system the chart scale used for facsimile transmissions will be reduced, and the new polar stereographic maps will be printed in a multiplicity of scales to meet the requirements of different offices.

Communications

The meteorological teletype system continued to expand during the fiscal year and reached a total of 54,000 miles of circuit with 351 stations served by 534 connections. Twenty-seven offices were added to the teletype system during this period.

Major changes carried out included the conversion of United States Services "A" and "C" teletype circuit extensions into Canada from 75-speed to 100-speed operation, which required a similar conversion of Canadian teletype field circuits at Montreal, Toronto, Winnipeg, and Vancouver main relay centres; transfer of

the teletype relay centre at Moncton to Halifax; and the expansion of the teletype relay centre at Montreal as a result of the amalgamation of the domestic and trans-Atlantic forecast establishments.

The Canadian weatherfax system had a total of 13,000 airline miles of circuit, serving 67 stations equipped with 76 connections. Five stations were added to the system.

During the winter special arrangements were made for facsimile transmission of aerial ice observers charts from Seven Islands and Sydney over long-distance telephone circuits to the Ice Central at Halifax.

Research

Research and development work carried out included the fields of numerical weather prediction, vertical velocities, the Arctic stratosphere, high latitude jet streams, air pollution, ozone, radiation, cloud and precipitation physics, high-level turbulence, radiative and turbulent fluxes in the atmosphere, diffusion of particulate matter, calibration and behaviour of radiation instruments, and energy transformation in the atmosphere.

Air Pollution—Requests for meteorological assistance in air pollution studies showed a marked increase, and included such organizations as the Occupational Health Division of the Department of National Health and Welfare, Atomic Energy of Canada Ltd., the provincial governments of Nova Scotia, Quebec, Ontario, Manitoba and Alberta, the cities of Hamilton and Vancouver, the National Research Council, the Ontario Research Foundation, and the St. Clair River Research Committee.

An 8-foot portable, digital, micrometeorological tower has been obtained for use in field studies of pollution diffusion. In addition, permanent 150 to 300-foot micrometeorological installations have been erected by some of the co-operating air pollution organizations at Ottawa, Chalk River, Des Joachims and Sarnia. A special investigation of the low level temperature structure at Whiteshell, Man., was undertaken during the winter months with a tethered kytoon.

A 10-year study of the heat fluxes by evaporation and turbulence at Weather Station "P" in the Pacific Ocean was completed for the Fisheries Research Board.

Ozone—The ozone research program with ozone spectrophotometers continued at Scarborough, Moosonee, Resolute, and Edmonton. Experimental work at the ozone laboratory in Scarborough has been devoted to the study of electrochemical techniques for the measurement of surface ozone concentrations, improvement in the performance of the ozone spectrophotometer, and the improvement of the facilities of the laboratory.

Radiation—Four new stations, all at Experimental Farms, were added to the solar radiation network, making a total of 29 branch and co-operating stations in addition to the National Radiation Centre at Scarborough.

Ventilated net radiometer measurements were started at the National Radiation Centre in August. In addition, the radiation research group calibrated radiation equipment for the Jacobsen McGill Expedition to Axel Heiburg Island; calibrated and installed radiation equipment at Port Burwell, Ont., for the 1960 summer

operations of the tobacco fleck project; installed an Eppley pyrhelimeter on research vessel *Porte Dauphine*; commenced a field comparison between a polythene shielded net radiometer (Australian model) and the ventilated net radiometer in use at Scarborough; and undertook a study of the radiation balance at Weather Station "P" for the Fisheries Research Board.

Cloud Physics

The Precipitation Physics Project, directed by the Meteorological Branch and begun in 1959, was expanded in 1960, the participating agencies of which now include the National Research Council, the Army and Air Force, the Telecommunications and Electronics Branch, the Department of Forestry, the Ontario and Quebec Departments of Lands and Forests, and the Canadian Pulp and Paper Association. In addition to investigation of precipitation mechanisms and the assessment of the effect of silver iodide seeding of major weather systems over relatively flat terrain, work also continued in the Alberta Hail Project.

In dynamic meteorology, research continued in numerical weather prediction and in studies of the stratosphere.

Numerical Weather Prediction

As a result of using high-speed electronic computers in numerical weather prediction and analysis methods, recommendation was made for obtaining a large high-speed electronic computer for the introduction of an operational numerical weather prediction program in the fiscal year 1962-63. The objective is to improve the accuracy of weather forecasts and to handle more effectively the large quantities of data required in modern meteorological services.

Instruments

Production of complete instruments or major instrument components totalled 1,830, an increase of 14 per cent over the previous year. Shipments of new and repaired instruments to stores totalled 1,520, an increase of 8 per cent.

The calibration laboratory was moved to a new location and the machine shop was expanded for the development of a full-scale model shop. Several additional shop machines were purchased which will be used jointly by the Design and Development Section and the Calibration Laboratory for the construction of models and prototype instruments and of calibration equipment.

A radiosonde for use on tethered balloons for microclimatological and micrometeorological measurements was developed and tested in prototype form at the Tobacco Fleck Project during the summer and at the Lac du Bonnet area in Manitoba in the winter. Further development and evaluation of this equipment is planned for 1961.

A micrometeorological profile tower with the digital recording system to be used in atmospheric pollution studies was accepted by the Department for test. Specifications were written and an order placed for microclimatological digital recording systems to be delivered in the summer of 1961.

Arctic Climatology

The Arctic Climatology Section, established during the year, made a study of an unusual weather system which produced heavy rainfall in many areas of the Arctic during the summer of 1960. Other projects under way are the comparison of terminal weather conditions at selected northern stations; freezing and thawing degree days; aerial photography weather; and studies of visibility and blowing snow conditions.

Hydrometeorology

With the acquisition of the Great Lakes research ship *Porte Dauphine*, the Hydrometeorology Section co-ordinated a much expanded meteorological program. Observations from the ship are proving of great value in operation forecasting and have yielded research papers on winter conditions over Lake Ontario, on the energy budget of Lake Ontario and on measurement of temperature, humidity and wind profiles over the Lakes.

The recording rain-gauge network was expanded by 20 new installations to provide the vital data on rainfall intensities required for the design of efficient drainage facilities and for hydrologic forecasting in Canada.

Research into the most critical meteorological conditions for floods along the north shore of the St. Lawrence River in Quebec and in the Saint John River basin of New Brunswick were continued, and special studies of the devastating January 1961 storms in southern British Columbia were undertaken.

Microclimatology

A study of meteorological conditions associated with the flecking of tobacco leaves in Norfolk County, Ont., was continued. Early in June a complete micro-climatological station and five satellite stations were established near Port Burwell. Observations of temperature, humidity and wind up to a height of 100 feet were undertaken along with careful observations of dew formation, evapo-transpiration, radiation, precipitation intensity, soil moisture and soil temperature in and near the crop. Study of the stability of the air in the first 1,000 feet of the atmosphere using wiresonde observations was also undertaken. This work was carried out in cooperation with the Federal Departments of Agriculture and National Health and Welfare, and a report was submitted to the inter-departmental committee responsible for this project.

Preliminary work on microclimatological conditions affecting fruit growing in southern Ontario was continued in collaboration with the Ontario Research Foundation.

Arctic Weather Stations

Special scientific projects carried out at the Joint Arctic Weather Stations included measurement of tides, sea ice thickness, snow temperature gradient and observations of the physical characteristics of snow, both surface and profile. An automatic tide gauge with the recorder remoted at the weather station was



C.M.S. *Edward Cornwallis*, lighthouse supply and buoy tender, at her home base, the new Dartmouth, N.S., Marine Agency.



The new C.M.S. *Beauport* (above) replaces the 40-year-old C.M.S. *Berthier* (below) in the St. Lawrence Ship Channel service.





Halifax International
Air Terminal



Waiting room,
Ottawa Air Terminal



Public reading room,
Montréal Air Terminal



D.O.T. nautical safety inspector testing lifejackets for buoyancy.



Sunken garden, spectator deck and control tower, Ottawa Air Terminal



Night view of sculpture screen and pool sculpture, Ottawa Air Terminal



Communications centre,
Montreal Air Terminal

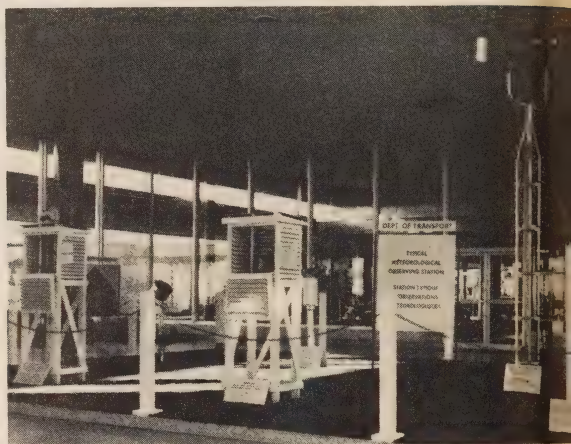


Exhibit of a typical D.O.T.
meteorological observing station



An artist's conception of a
meteorological satellite.



A physicist adjusts a net radiometer
used in radiation research.

installed at Alert in August, 1960. The soil temperature measurement program at Resolute, discontinued as the result of a fire in the early spring, was resumed in November, 1960.

With the transfer of upper air station operations from Aklavik to Inuvik in September, the last of the original radiosonde stations was transformed to rawinsonde operations.

Ice Reconnaissance and Observing

During the year ice observers flew more than 2,700 hours on ice reconnaissance in the Gulf of St. Lawrence and Newfoundland and Nova Scotia coastal waters from bases at Sydney and Gander from April 15 to June 30. From December 16 to March 31, fifty-eight missions were completed in the St. Lawrence River east of Quebec, the Gulf of St. Lawrence and coastal waters of Newfoundland. Because of the severity of ice conditions during part of the season, it was necessary to use, simultaneously, two chartered aircraft based at Seven Islands and Sydney.

Two "round robin" ice reconnaissance flights covering the general Arctic area from Resolution Island to Herschel Island, as well as Hudson Bay and Strait, were completed during April and May to obtain information for estimating break-up and seasonal ice outlook.

Ice reconnaissance covering the Hudson Bay route, Foxe Basin and Western Baffin Bay was accomplished by Field Ice Reconnaissance units based at Churchill and Frobisher Bay. Ice reconnaissance in support of Canadian shipping along Baffin Island was a completely Canadian effort this year, and there was a more complete coverage of Foxe Basin. From July 15 to September 14, ice reconnaissance was carried out in the Queen Elizabeth Islands.

To provide better support for shipping in the Western Arctic, ice reconnaissance from Cambridge Bay was expanded by greater use of chartered aircraft, supplemented by the co-operative use of Federal Electric aircraft.

Experimental ice reconnaissance over the Great Lakes, commenced in March, 1960, was continued in April and an expanded program to cover the Upper St. Lawrence River was inaugurated to provide information prior to the opening of the Seaway.



Icebreaker C.M.S. *Labrador* (foreground) freeing a freighter in Sydney Harbour, N.S., during the worst ice conditions in history, winter 1960-61.

MARINE SERVICES

Aids to Navigation

The program of converting oil-burning lights to modern automatic types is progressing and of the 3,054 lights in operation, 2,518 were automatic at the end of the fiscal year.

Buoys, beacons and markers of all types maintained on coastal and inland waterways number approximately 12,200. This includes 903 light buoys, 136 sound buoys and 285 light and sound buoys.

Construction

The lightstation at Camp Island, Labrador, was relocated and at the new site a dwelling, concrete lighthouse tower, fog-alarm building, winch house, two storage sheds and an access road were constructed by contract under the supervision of departmental engineers.

Eight dwelling units, three major concrete lighthouse towers and one fog alarm and radio beacon building were constructed by contract at other sites, either to replace obsolete structures or to provide additional dwelling accommodation at existing lighthouses.

In addition to these major projects, several new minor lighthouse towers were constructed and the regular repair program continued.

Engineering studies and soil investigation were made for a new lighthouse at Prince Shoal to replace the present lightship, and the design for a new lighthouse pier and superstructure is under preparation. Engineering studies were also made for replacement of the piers and superstructures for the range lights at Brûlé Bank, Que.

The overall program of providing aids for the Seaway channels is continuing. Design and soil investigation programs were carried out to determine foundation conditions for proposed piers for the new Southeast Bend Navigation Channel in the St. Clair River, Ont., and a contract for two light piers in the Detroit River near Amherstburg, Ont., has been awarded.

The extension to Queen's Wharf at Quebec Marine Agency was completed and the final drawings and specifications for the new Agency wharf at Charlottetown were under study.

A general program of improvement or replacement of District Marine Agency offices, stores and workshops is being carried out. Construction of new offices, stores and shops buildings at Saint John, N.B., was begun and the work was approximately 30 per cent completed at the end of the fiscal year. Plans are being made for similar work at St. John's, Nfld., Charlottetown, P.E.I., Prescott, Ont., and Victoria and Prince Rupert, B.C.

Mechanical Equipment

No new fog-alarm stations were established during the year, but in many locations new machinery was installed to replace worn out or obsolete equipment. To provide modern living conditions and a more efficient light, installation of electrical generators at lighthouses has continued where commercial power is not available.

New hoisting equipment, power winches, and tractors have been provided at major lightstations to facilitate landing and hauling supplies, and at the Marine depot for handling heavy equipment. Workshop facilities at Dartmouth and Saint John were improved by the addition of new forges and power tools.

Under the control of the Prescott depot, a number of plastic buoys were tested, and several new types were designed and are now in general use in the Districts.

Electrical Equipment

New photometric equipment for measuring light intensity in lighthouse lamps was acquired for the test room at the Prescott depot. A new electric fog signal is being field tested at Cobourg lighthouse and another type at Point Petre. A new commercially-produced sunswitch to control lights automatically and a new light fitted with co-incident lenses are under test at Prescott.

Special Equipment

Among special equipment designed in conjunction with National Research Council scientists are a new micro-wave controller for the Holland Rock, B.C., fog alarm station and a proportional charging apparatus for use at Pelee Passage lighthouse. A number of new electric horns have been field tested at various stations and a new type of air-operated horn will be placed on test.

Lightstation Helicopter Service

Test flights carried out during the summer and autumn with helicopters based on departmental supply vessels proved their great usefulness in inspecting

lightstations and carrying out minor maintenance. As a result, landing areas are being provided at many lightstations on both coasts and on the Great Lakes. The use of helicopters will also lessen transportation problems in cases of emergency or serious illness.

Canals

Traffic—Traffic on the Carillon and Grenville canals has been curtailed during the construction of the Quebec Hydro dam in the Ottawa River which is expected to be completed in the Spring of 1962. Pleasure boat traffic on the other canals continued to rise, with the Rideau and Trent canals showing a substantial increase over the past year. Pleasure craft lockages through the Rideau totalled 38,821 and the Trent, 72,874, an increase of 4,063 over the previous year for the Rideau and 10,939 for the Trent.

Construction—Work completed in modernizing and rehabilitating the Trent System included construction of four sets of lockgates, installing 20-ton capacity winches at the marine railways, erection of a new dam at Eagle Lake, constructing a new wharf and tie-up facilities at Burleigh Falls, and widening and strengthening the highway bascule bridge at Campbellford.

Major concrete restoration work was carried out at five locks.

The new Bronson Avenue high-level bridge over the Rideau Canal was completed and opened to traffic in July, 1960, and the old swing bridge was dismantled and removed the following February.

The Department contributed to the cost of constructing a high-level fixed bridge by the County of Carleton approximately a mile north of Kars swing bridge. The bridge is expected to be ready for traffic by the end of July, 1961.

At the Soulanges Canal four bridge were replaced by causeways. Engineering studies and investigations were carried out on all canals for new construction and continuing improvements. Detailed design was started for a new lock to replace two existing locks at Fenelon Falls on the Trent Canal.

Harbours and Property

Harbour Commissions—The proclamation of the Nanaimo Harbour Commissioners Act, effective January 1, 1961, brings the total of active Harbour Commissions to ten. Federal statute authorized the transfer of the Oshawa Harbour to Harbour Commissioners' control and arrangements are in preparation for proclamation of the Act.

Public Harbours—There are 313 public harbours proclaimed under the Canada Shipping Act and controlled by the Department, 115 of which are in charge of Harbour Masters. Harbour dues collected totalled \$201,337, an increase of \$6,957 over the previous year.

Government Wharves—There are over 2,500 wharves, piers, and breakwaters under the administration of the Department, 481 of which are in charge of wharfingers. Revenue from wharf properties amounted to \$987,511, an increase of \$90,376 over the preceding year.

Water Lots and Lands—The number of water-lots leases in effect during the year totalled 221, yielding a total rental of \$39,608.

St. Lawrence Ship Channel

Two new survey and inspections vessels went into service in 1960—the CMS *Beauport* in June and CMS *Ville Marie* in July—and the 44-year-old CMS *Berthier* was declared surplus.

The hydraulic section, established in 1959, collected and correlated a mass of hydraulic and hydrographic data in preparation for a long-term water-level study.

On May 5 the 570-ton coastal trader *Federal Express*, struck by a larger ship leaving port, sank in the main ship channel opposite the Montreal entrance to the St. Lawrence Seaway. Salvage operations were supervised by the Ship Channel Division and completed on October 14.

Construction—The removal of boulders at St. Antoine Middle Ground opened this area to navigation in the spring of 1961.

Work in the Boat Island, Champlain Curve and Channel, and MacKay Pier areas was completed, and in the Barre a Boulard Channel and Cap Sante-Ste. Croix with only minor clean-up remaining.

Maintenance—Maintenance dredging was carried out in the East Narrows, Cap Brule Range, Cap Sante-Ste. Croix Channel and Montreal Harbour. Maintenance surveys and sweeping were carried out in St. Charles River and Wolfe's Cove in Quebec, and all the berths in Three Rivers.

Steamship Inspection

Regulations pertaining to machinery inspection and construction, and the method of computing the horse-power of engines were amended to meet changing conditions. Fire detection and extinguishing equipment regulations are being completely re-written, and the handbook of approved diesel engines and reduction gears has been supplemented by the addition of sixteen approved reduction gears and 85 approved diesel engines designs.

Inspections carried out included 101 new ships completed in Canada, 48 ships converted or re-conditioned, and seven ships built outside Canada and transferred to Canadian registry. In addition, 1,668 Canadian registered vessels were inspected and 28 registered or owned elsewhere, totalling 1,590,400 gross tons.

Inspections of ships' tackle numbered 5,207, an increase of 1,101 over the previous year; of these, 211 cases required repairs, adjustments or testing of cargo handling gear.

To ensure that all foreign ships proceeding to ports in the Great Lakes comply with Seaway regulations before they enter the locks, close liaison has been established between the Seaway Authority and the Steamship Inspection Service.

Facilities in Newfoundland—Treasury Board approved in principle construction of dry dock facilities at Clarendville, and preliminary negotiations were commenced with the Newfoundland Fisheries Development authority for a proposed

facility at Lewisport to consist of a marine haul-out of about 75 tons safe-lifting capacity with associated transfer system for ten ships.

The selection of an appropriate site on the south coast of Newfoundland for the location of a haul-out of about 500 tons safe-lifting capacity is under consideration.

These facilities are necessary for periodical "out of the water" ship inspections required under the Canada Shipping Act, and existing facilities in Newfoundland are inadequate.

Nuclear Power Committees

The Marine Regulations Branch provided one sitting member and the secretary to the Nuclear Power Committee, set up to enquire into the feasibility of marine nuclear propulsion, and the Chairman and secretary of the Nuclear Vessel Control Co-ordinating Committee which studies the problems associated with the movement of nuclear powered ships in Canadian waters.

Marine Safety

The Canadian delegation to the International Conference for the Safety of Life at Sea, held in London, England, in May and June, 1960, was headed by the Director of Marine Regulations. Of particular significance to Canada is the exemption obtained—except for navigation safety requirements—from the Convention requirements for all vessels operating on the Great Lakes and the St. Lawrence River as far east as Anticosti Island.

The use of inflatable life rafts as statutory life-saving equipment on Convention ships was unanimously approved.

Lifejackets—The Lifejacket Committee met to discuss a new proposed life-jacket for small children and research is now in progress. Work on the Department's new standard lifejacket—in two sizes—is almost completed.

Small Boat Power and Capacity Plates—The voluntary program of issuing safe power and capacity plates to outboard motor boats continued and approximately 30,000 boats have now been issued with these plates.

Pleasure Craft Safety—The education campaign to promote boating safety was continued and the Department's Small Vessels Officer toured the country addressing boating groups, yacht clubs, and other related groups, and safety equipment was displayed at booths in the Canadian National Exhibition and at various large boat shows. A new edition of the publication, *Safety Afloat*, was printed and 275,000 English and 35,000 French were distributed.

Oil Pollution Prevention

A motor boat patrol was again carried out during the summer months to guard against oil pollution in the St. Lawrence River between Montreal and Three Rivers. Masters of departmental and Fisheries Department ships, and Fisheries Officers were designated oil pollution officers during the year.

RCAF and RCN flying patrols are authorized to report observed infractions of the Oil Pollution Prevention Regulations and a close liaison is maintained with

these two organizations. An officer of the Department carried out a four-week intensive tour of Newfoundland waters because of the particular problems associated with oil pollution in that area. Violations of the Regulations brought one conviction in the Great Lakes area and one in British Columbia. Preparations are under way for attendance at the Oil Pollution Conference (IMCO) in London, England, in 1962.

Air Pollution

As a result of the report of the Canadian Section of the International Joint Commission on Air Pollution in the Detroit River area, the Steamship Inspection Service held meetings with the Technical Advisory Board of the International Joint Commission and provincial and municipal air pollution prevention agencies. The objective of the discussions was to establish means of preventing pollution of the air by ships.

Marine Engineer Training

Seven trainees under the Department's marine engineer training scheme completed the required four-year apprenticeship and are now serving as Junior Engineer Officers on departmental ships. The second group are completing their second year of training, and authority has been received to commence the training of a third group of five trainees this coming year.

The Marine Engineering School at Hamilton, Ont., which is under the control of the Department, operated successfully during the winter months and instruction was given to marine engineers for all grades of certificates.

Engineer Examinations—Of 1,000 candidates for certificates of competency as marine engineers, 805 were successful and 71 obtained partial passes.

Revenue—Revenue collected, including fees for inspection services, totalled \$159,999.

Ship Registration

Small vessels exempt from registry and licensed under the Small Vessel Regulations numbered 53,056, making a total of 357,317 issued throughout Canada to December 31, 1960. During the same period, 1,238 vessels were added to Canadian registry and 364 removed, making a net increase of 874. At the end of December, there were 20,381 vessels of 2,580,226 gross tons registered in Canada.

The Registrar General of Shipping and Seamen in the United Kingdom was supplied with information on approximately 7,725 separate transactions involving first registry, re-registry, transfers and transmissions of ownership, mortgages and changes of name, together with details of all vessels registered during this period. This information is used in compiling the *Mercantile Navy List and Maritime Directory*, which shows particulars of all vessels registered in the Commonwealth.

Revenue from various types of registry transactions for the fiscal year totalled \$12,128.75.

Hudson Bay Route

The thirty-second annual report on navigation conditions on the Hudson Bay route from the Atlantic seaboard to the Port of Churchill, covering the 1960 season of navigation, was prepared and published.

Grain Loading Arrangements and Live Stock Shipping

Grain loading arrangement plans inspected and approved by headquarters for ships expecting to load grain in Canada totalled 176. Under the supervision of the Inspector of Live Stock Shipments, 2,053 head of live stock were shipped from Montreal to ports abroad on ships fitted as prescribed by the Live Stock Shipping Regulations.

Salvage

During the 1960 navigation season, a subsidy contract of \$75,000 was in effect with Foundation Maritime Limited. The contract required the provision and maintenance of a salvage wrecking plant complete for service in the River and Gulf of St. Lawrence.

Lifesaving Stations

Lifesaving stations were maintained at Clayoquot and Banfield, B.C., and Bay View, N.S., each equipped with a modern 36' 8" self-righting motor lifeboat, manned by a full-time crew of seven. In addition, one full-time patrolman and two seasonal were employed on the West Coast Trail to assist in keeping it clear of fallen timber, repairing bridges, and patrolling the beach.

Pilotage

During the year there were 374 licensed pilots engaged in pilotage in the nine districts for which the Minister of Transport is the pilotage authority. They performed 44,357 pilotages inward or outward, and 21,472 movages. A gross amount of \$5,055,027.22 was earned in pilotage fees.

On November 17, 1960, these pilotage districts were increased to ten with the division of the St. Lawrence-Kingston-Ottawa district into two—Cornwall Pilotage District and Kingston Pilotage District.

During the navigation season, the Department employed two pilots to assist ships into and out of Goose Bay when required.

Port Weller-Sarnia Pilotage Area—Under Prevailing Rate Regulations the Department employed 50 pilots to conduct ships from Port Weller to Sarnia. During the period, 1,992 pilotages were made, grossing \$556,482 in fees.

Masters, Mates and Seamen

Examinations held for Masters, and First and Second Mates Certificates of Competency and Service totalled 759. In addition, 83 sight test examinations were held. A total of 518 Masters, 119 First Mates, and 122 Second Mates were granted certificates, and 418 renewals of Temporary Masters Certificates were issued for which no examinations were held.

Eight seamen received Certificates of Qualification as Ships' Cooks, and 51 received Certificates of Qualification as Able Seamen. A total of 146 seamen were examined for Certificates of Efficiency as lifeboatmen, of which 144 were granted certificates.

Examination fees totalled \$8,983.

Navigation Schools

At Quebec, Hamilton, and Prince Rupert, navigation schools were fully maintained by the Department in the winter months only. The school at Prince Rupert gives instruction chiefly for the benefit of small vessel operators.

Financial aid was provided to navigation schools under local education authorities at Halifax, Montreal, and Vancouver.

Marine Casualty Investigations

During the year, 28 preliminary inquiries and one formal investigation into marine casualties were held.

Departmental Fleet

On January 1, 1960, the Department's fleet was officially designated the Canadian Marine Service. During the year, the fleet was increased by the commissioning of a triple screw icebreaker, CMS *John A. Macdonald*, and of a buoy and supply vessel, CMS *Thomas Carleton*. Northern supply vessel, CMS *Nanook*, was converted to a depot and accommodation ship for landing-craft crews and stevedores. Two other vessels, CMS *Ville Marie* and CMS *Beauport*, were commissioned for special service in the St. Lawrence Ship Channel.

A uniform system of position reporting, which also serves the RCAF Rescue Co-ordination Centres, was introduced, together with a standard form of communication. Full information on current and future movements of ships is now available in the Operations Centre in Ottawa.

Northern Operations

Icebreaker support of merchant vessels proceeding to Churchill commenced in the Hudson Strait on July 23. The quantity of ice on the western side of Hudson Bay across the approaches to Churchill made the job unusually difficult. Forty-eight commercial vessels loaded 19,600,000 bushels of grain at Churchill during the season, the last vessel clearing on October 13.

In 1960, an icebreaker—CMS *Camsell*—based on the west coast sailed, for the first time, around Alaska to support the western Arctic supply vessels and proceeded as far east as Shepherd's Bay, at one time operating to the eastward of East Coast vessels operating further to the north.

In last year's northern operations, 118 government and chartered ships travelled a total of 290,000 miles carrying 108,000 tons of supplies. The CMS ships also carried hydrographic and oceanographic teams.

Icebreaking

The season was marked by very heavy ice conditions. By early February the entire Gulf was filled with ice, requiring icebreaker escort for all merchant ships attempting to make ports in the Gulf.

A booklet, *Guidance to Merchant Shipping Navigating in the Gulf of St. Lawrence*, was compiled with the assistance of all interested ship owners and agents, and given wide distribution before the season commenced.

Arrangements were also made for an Ice Operations Room to be set up in Sydney Naval Base to co-ordinate the movements of icebreakers and merchant ships in the Gulf and to issue ice information and recommended routes.

Although the first ocean-going ship reached Montreal on March 27, there was a great deal of ice in the Gulf, indicative of prolonged operations.

On the Great Lakes, CMS *Alexander Henry* was stationed at Midland during the winter to assist the limited movement of grain ships in that area, and reached the Lakehead in time to break it out before the arrival of the first cargo ships.

CMS Porte Dauphine

In addition to her operations in the Great Lakes on research and scientific projects for the Meteorological Branch and the Great Lakes Institute, the CMS *Porte Dauphine* assisted with icebreaking at the Lakehead and Toronto. During her extensive refit in February and March, she was temporarily replaced by CMS *Grenville*.

Weatherships

Weatherships CMS *Stonetown* and CMS *St. Catherines* maintained a continuous patrol at ocean weather station "P", some 900 miles out in the Pacific.

Search and Rescue

Marine Search and Rescue Co-ordinators were appointed and attached to the RCAF Rescue Co-ordination centres at Halifax, Trenton and Vancouver.

Ship Construction and Repair

Ten vessels were completed: CMS *Thomas Carleton*, light icebreaker, supply and buoy vessel for service in the Bay of Fundy; CMS *Beauport* and *Ville Marie* for St. Lawrence Ship Channel service; icebreaker CMS *John A. Macdonald* for service in the Maritimes and northern waters; three 56-foot landing barges for northern supply operations; MV *Pelee Islander*, automobile and passenger ferry for service between Pelee Island and the Ontario mainland; MV *John Guy*, automobile and passenger ferry for service between Bell Island and Portugal Cove, Nfld.; and MV *Hopedale*, passenger and cargo vessel for C.N.R. Labrador coastal service.

Eleven ships were under construction: the *Eckaloo*, a shallow draft vessel for service at Fort Smith, N.W.T.; two pilot boats, one for service at Les Escoumins, Que., and the other for service at Sydney, N.S.; a 34-foot work boat

for Lake Simcoe (Trent Canal); an automobile and passenger ferry, *Confederation*, for service between Cape Tormentine, N.B., and Borden, P.E.I.; a passenger and cargo vessel, *Petite Forte*, for C.N.R. Newfoundland coastal service; two passenger and cargo vessels, *Federal Maple* and *Federal Palm*, for service in the West Indies Federation; a tug for National Harbours Board service at Churchill, Man.; a patrol vessel for the Department of Fisheries; and a tug for the Department of Public Works.

Twenty-one vessels were in the design stage: five 95-foot and three 65-foot for search and rescue patrol; a cable repair ship and icebreaker; a depot ship for service in the North; two weatherships; a supply and buoy vessel for service in the Prescott Agency, and one for Sorel; one shallow draft vessel for service in the Mackenzie River; a buoy-lifting work scow for service on the Rideau Canal; two passenger and cargo vessels for Canadian National Railways Newfoundland and Labrador coastal service; one research vessel and one sea-going for the Fisheries Research Board; and a ferry for the Department of Citizenship and Immigration (Indian Affairs) for service between Christian Island and the mainland.

Repairs—The sum of \$2,477,178 was expended on repairs.

RAILWAY SERVICES

Canadian National Railways

The Canadian National Railways operated at a deficit of \$67,496,777 in 1960 as compared with a deficit of \$43,588,290 the previous year.

Prince Edward Island Ferry and Terminals

The Prince Edward Island ferry service operated at a deficit of \$2,621,464 in 1960 compared with a deficit of \$2,566,090 in 1959.

Expenditure for dredging and improvements to the Tormentine dock amounted to \$211,831.

Expenditure on the new ferry for this service, for which a contract was awarded in December 1959, was \$1,485,120, making a total of \$1,514,854 to March 31, 1961.

The movement of highway vehicles to and from Prince Edward Island continues to increase. In 1960 some 171,240 highway vehicles were handled—an increase of approximately 9 per cent over 1959.

In 1960 rail freight handled amounted to 699,822 tons compared with 820,541 in 1959, a decrease of over 17 per cent.

Newfoundland Ferry Services

In addition to the regular freight and passenger service operated between North Sydney, N.S., and Port aux Basques, Nfld., a freight service only was operated throughout the year between North Sydney, N.S., and various Newfoundland ports as required.

Docks and Terminals—Expenditures for additions and betterments to the terminal facilities at North Sydney amounted to \$405,865, and at Port aux Basques, \$83,047.

Yarmouth, N.S.—Bar Harbor, Me., Ferry Service

This service operated at a deficit of \$151,224 as compared with \$194,203 the previous year.

Traffic handled consisted of 93,547 passengers, 27,681 automobiles, 2,820 trucks and 540 other highway vehicles, a slight increase over the previous year.

Canso Causeway

Expenditure on the Canso Causeway during the fiscal year amounted to \$910 for the acquisition of land and legal fees. The total expenditure on the construction of the Causeway and related facilities to March 31, 1961, amounted to \$20,158,111.

Railway Subsidies

No subsidies were paid in aid of railway construction during the year.

Railway to Great Slave Lake

In November, 1960, the Canadian National Railway Company was appointed agent of Her Majesty to carry out a location survey for a proposed railway from Grimshaw, Alta., to Pine Point, Great Slave Lake.

The estimated cost of the location survey is \$800,000, which will be completed late in 1961. The 1960-61 expenditure amounted to \$56,092.

Maritime Freight Rates Act

Payments under the Maritime Freight Rates Act amounted to \$14,064,800, a decrease of \$196,401 from the previous year.

FINANCIAL SUMMARY

(Comparative Summary of Expenditures and Revenues)
(for the Fiscal Years Ended March 31, 1960 and 1961)

	<i>Millions of Dollars</i>		
			<i>Increase (+)</i> <i>or</i> <i>Decrease (—)</i>
	<i>1960-61</i>	<i>1959-60</i>	
<i>Administration, Operation and Maintenance Expenditures</i>			
Departmental Administration	3.1	2.9	.2 (+)
Air Services	70.5	59.5	11.0 (+)
*Marine Services	35.1	31.2	3.9 (+)
Railway and Steamship Services	92.7	67.8	24.9 (+)
Miscellaneous Services	51.1	38.1	13.0 (+)
	<hr/> 252.5	<hr/> 199.5	<hr/> 53.0 (+)
<i>Capital Expenditures</i>			
Air Services	63.4	64.6	1.2 (—)
*Marine Services	14.0	27.9	13.9 (—)
Railway and Steamship Services	6.0	2.4	3.6 (+)
	<hr/> 83.4	<hr/> 94.9	<hr/> 11.5 (—)
TOTAL DEPARTMENTAL EXPENDITURES	<hr/> <hr/> 335.9	<hr/> <hr/> 294.4	<hr/> <hr/> 41.5 (+)
<i>Revenues</i>			
Air Services	15.7	12.5	3.2 (+)
*Marine Services	8.2	4.8	3.4 (+)
Railway and Steamship Services	5.2	.6	4.6 (+)
	<hr/> 29.1	<hr/> 17.9	<hr/> 11.2 (+)
<i>Miscellaneous Services</i>			
(1) Preliminary expenses recovered from the St. Lawrence Seaway Authority .....	....	1.6	1.6 (—)
(2) Interest—St. Lawrence Seaway Authority Loans	13.1	5.0	8.1 (+)
	<hr/> 13.1	<hr/> 6.6	<hr/> 6.5 (+)
TOTAL DEPARTMENTAL REVENUES	<hr/> <hr/> 42.2	<hr/> <hr/> 24.5	<hr/> <hr/> 17.7 (+)

*The former Canals Services have been included.

EXPLANATION OF INCREASES AND DECREASES

***Administration, Operation and Maintenance Expenditures**

Departmental Administration

The increase in administrative costs reflects the efforts of the Department to meet the requirement of modern transportation for greater air and marine services.

Air Services

Continued growth of the air transport industry has necessitated increased departmental facilities and services. The additional expenditures included: Civil Aviation Branch, \$5.0 million; Telecommunications and Electronics Branch, \$2.2 million; and Meteorological Branch, \$3.1 million.

Marine Services

The increase in Marine Services expenditures was due in large part to: Aids to Navigation, \$1.6 million; Pilotage Services, \$0.4 million; Operating Deficits of Canals and Works entrusted to the St. Lawrence Seaway Authority, \$0.5 million; and Marine Operations Branch, \$1.2 million.

Railway and Steamship Services

The operating deficit of the CNR, which is included in the expenditures for these services, was \$67.5 million in 1960-61 or \$24.0 million more than in 1959-60. The inclusion of \$2.6 million to cover the operating deficit of TCA was partly offset by reductions in other areas of operations.

Miscellaneous Services

During 1960-61, the statutory contributions made to Canadian railways by the Board of Transport Commissioners for Canada to compensate for freight rate reductions amounted to \$20.4 million, whereas the corresponding contributions during 1959-60 were \$7.8 million.

Capital Expenditures

Air Services

The decrease of \$1.2 million was due principally to a reduction in expenditures on construction or acquisition of buildings, works, land and equipment for radio aids to air and marine navigation.

*There was an increase in expenditure in all appropriations containing salary provisions due to the general salary revision during 1960-61.

Marine Services

A decline of \$11.0 million in expenditure for Marine Service steamers and \$1.8 for dredging of the River St. Lawrence Ship Channel accounted for the greater portion of the decrease in this classification.

Railway and Steamship Services

There was a continuation during the year of the Department's program to provide improved auto-ferry services for the Atlantic provinces and passenger-cargo vessels, together with better harbour facilities, for the Newfoundland coastal services.

Revenues

Air Services

An increase in air traffic and airport facilities together with further development of revenue sources has resulted in added revenue of \$2.0 million for the Civil Aviation Branch and \$1.1 million for the Telecommunications and Electronics Branch.

Marine Services

During 1960-61, a payment of \$3.9 million was received for the supply support of Dew Line stations for the year 1959.

Railway and Steamship Services

In 1960-61, an amount of \$4.9 million was paid by the Province of Nova Scotia as its share of the cost to date of the Canso Causeway.

DEPARTMENT OF TRANSPORT

AIR SERVICES

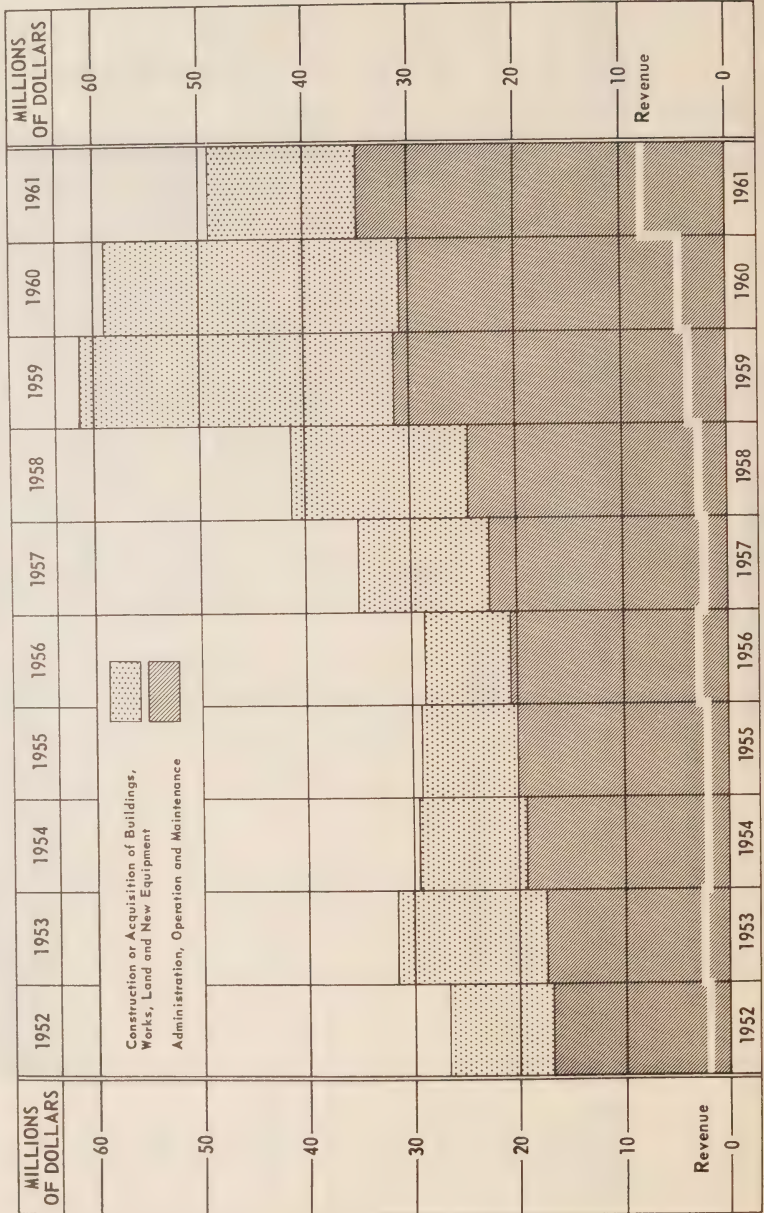
EXPENDITURES AND REVENUES FOR THE FISCAL YEARS 1951-52 TO 1960-61 INCLUSIVE

MILLIONS OF DOLLARS	1952	1953	1954	1955	1956	1957	1958	1959	1960	1961	MILLIONS OF DOLLARS
— 137.5											— 137.5
— 125.0											— 125.0
— 112.5											— 112.5
— 100.0											— 100.0
— 87.5											— 87.5
— 75.0											— 75.0
— 62.5											— 62.5
— 50.0											— 50.0
— 37.5											— 37.5
— 25.0											— 25.0
Revenue											Revenue
— 12.5											— 12.5
— 0											— 0

Construction or acquisition of buildings
works, land and new equipment

Administration, operation and maintenance

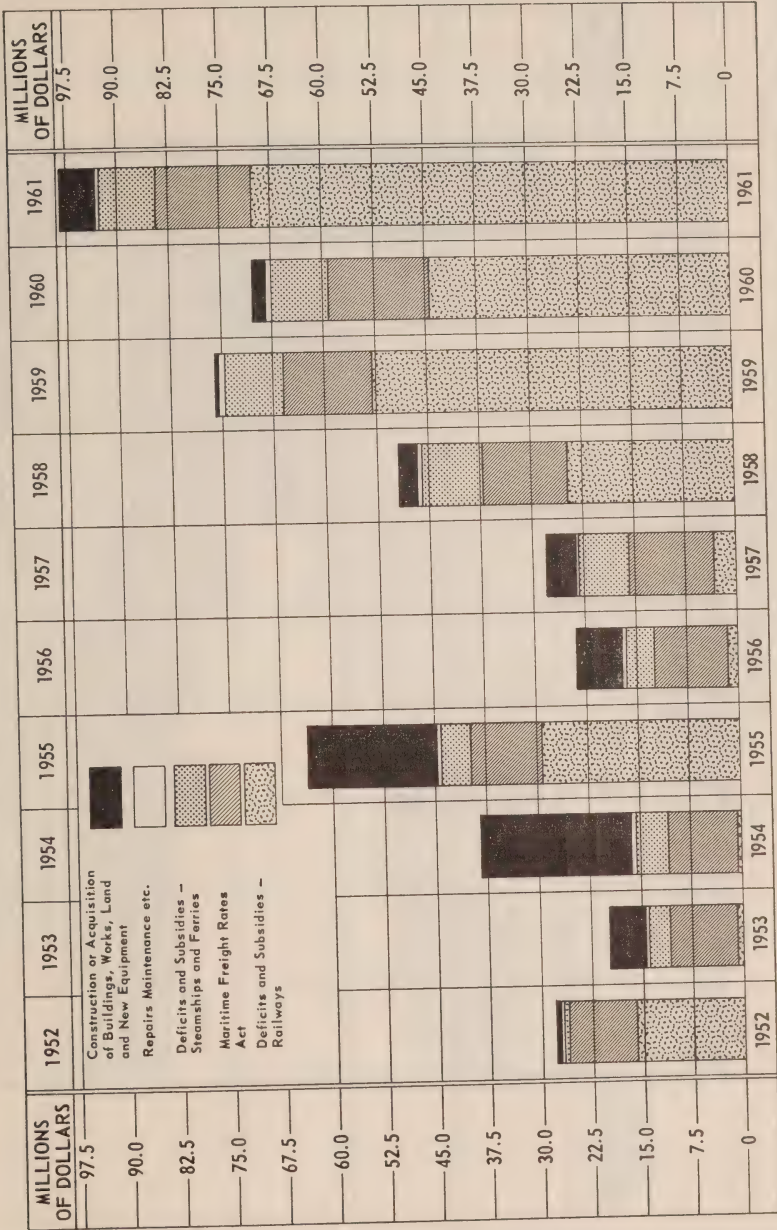
DEPARTMENT OF TRANSPORT
*
MARINE SERVICES EXPENDITURES AND REVENUES
FOR THE FISCAL YEARS 1951-52 TO 1960-61 INCLUSIVE



* THE FORMER CANAL SERVICES HAVE BEEN INCLUDED

DEPARTMENT OF TRANSPORT
RAILWAY AND STEAMSHIP SERVICES

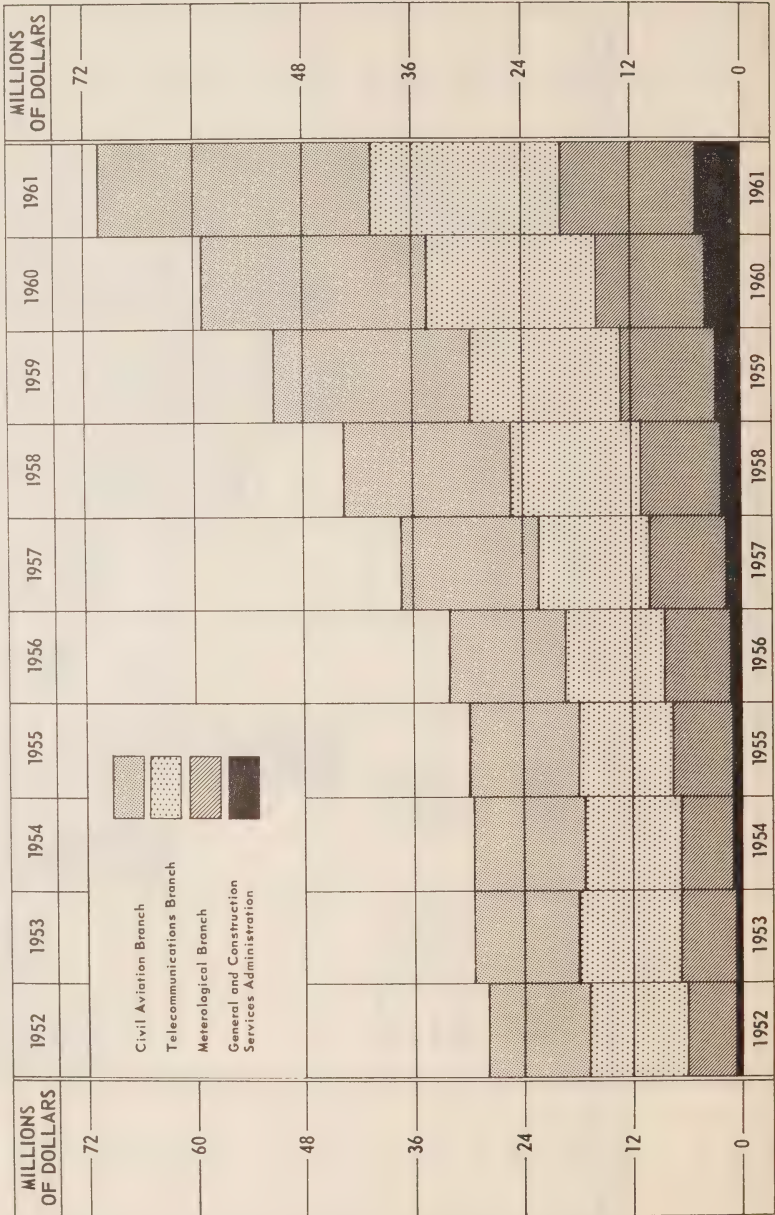
EXPENDITURES FOR THE FISCAL YEARS 1951-52 TO 1960-61 INCLUSIVE



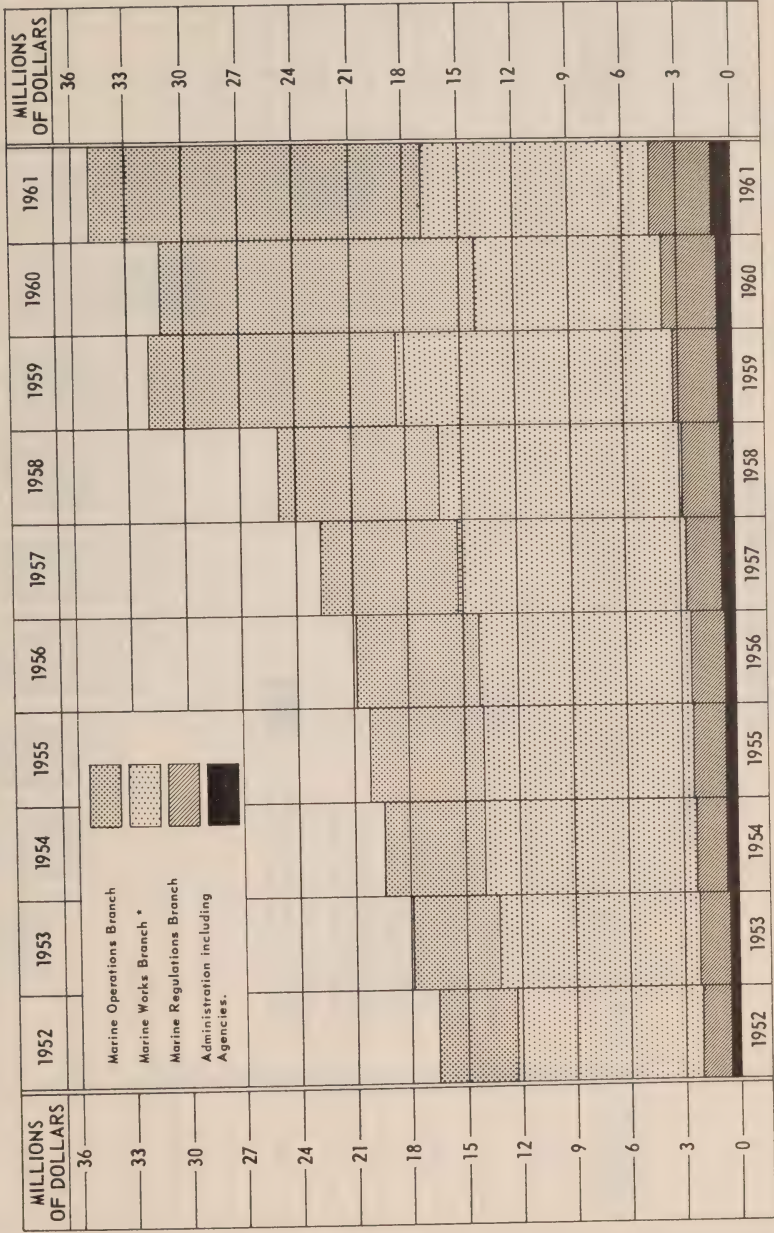
DEPARTMENT OF TRANSPORT

AIR SERVICES - ADMINISTRATION OPERATION AND MAINTENANCE EXPENDITURES

FOR THE FISCAL YEARS 1951-52 TO 1960-61 INCLUSIVE



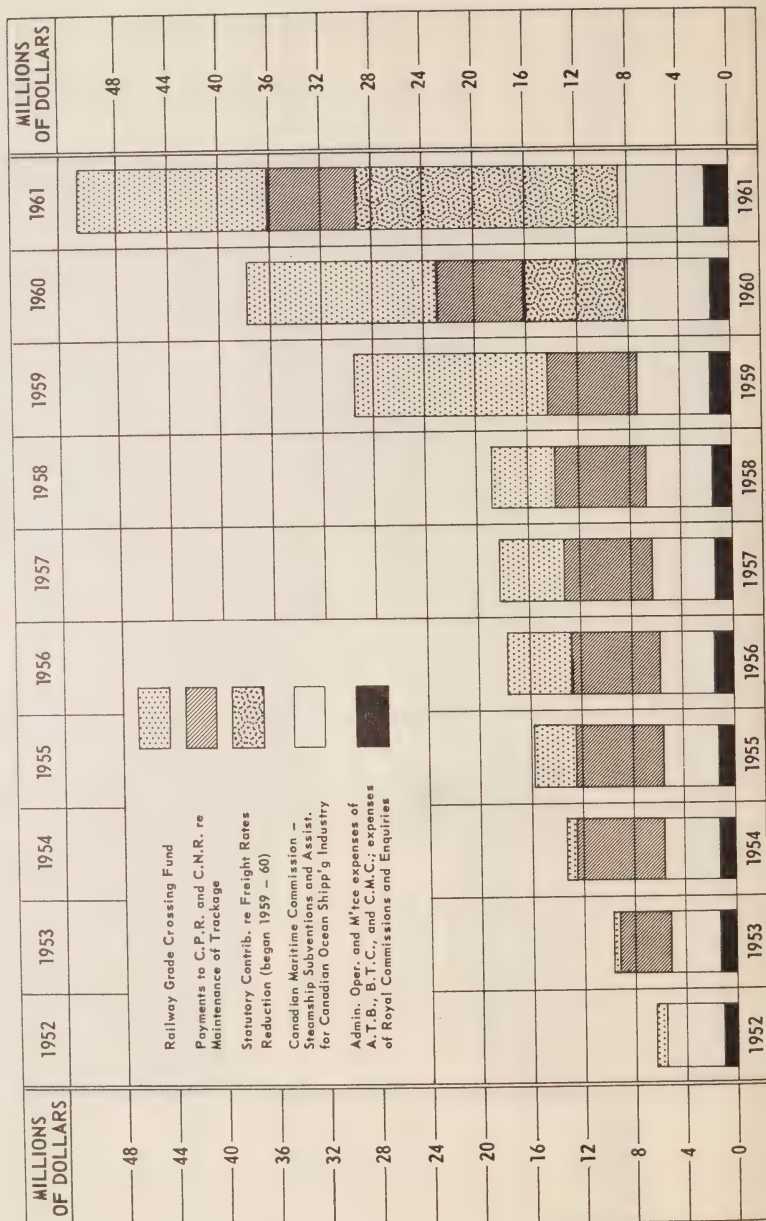
DEPARTMENT OF TRANSPORT

MARINE SERVICES - ADMINISTRATION OPERATION AND MAINTENANCE EXPENDITURES
FOR THE FISCAL YEARS 1951-52 TO 1960-61 INCLUSIVE

* THE FORMER CANAL SERVICES HAVE BEEN INCLUDED

MISCELLANEOUS SERVICES- EXPENDITURES

FOR THE FISCAL YEARS 1951-52 TO 1960-61 INCLUSIVE









1961
1962

Annual Report

FOR THE FISCAL YEAR ENDING MARCH 31, 1962

DEPARTMENT OF TRANSPORT

OTTAWA, CANADA

ANNUAL REPORT
Department of Transport

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Ottawa, Canada



CANADA

DEPARTMENT OF TRANSPORT

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ANNUAL REPORT

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FOR THE FISCAL YEAR ENDED

MARCH 31

1962

Submitted Under the Provisions of the
DEPARTMENT OF TRANSPORT ACT

ROGER DUHAMEL, F.R.S.C.
QUEEN'S PRINTER AND CONTROLLER OF STATIONERY
OTTAWA, 1963



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*To His Excellency Major-General Georges P. Vanier, D.S.O., M.C., C.D.
Governor General and Commander-in-Chief of Canada.*

MAY IT PLEASE YOUR EXCELLENCY:

The undersigned has the honour to present to Your Excellency the Annual Report of the Department of Transport, for the fiscal year ended March 31, 1962.

LEON BALCER, Q.C.,
Minister of Transport.

MINISTRY OF TRANSPORT MINISTER

BOARDS, COMMISSIONS AND GOVERNMENT-OWNED COMPANIES

Air Transport Board
Board of Transport Commissioners
Canadian Maritime Commission
Canadian National Railways
Canadian National (West Indies) SS. Co.
Canadian Government Merchant Marine, Ltd.
Canadian Overseas Telecommunication Corporation
National Harbours Board
St. Lawrence Seaway Authority
Steamship Inspection Board
Trans-Canada Air Lines

ACTS ADMINISTERED BY THE DEPARTMENT OF TRANSPORT

GENERAL

Bills of Lading Act
Canadian Overseas Telecommunication Corporation Act
Department of Transport Act
St. Lawrence Seaway Authority
Telegraph Act
Transport Act

AIR SERVICES

Aeronautics Act
Carriage of Goods by Air Act
Foreign Aircraft Third Party Damage
Radio Act

MARINE

Belleville Harbour Commissioners Act
Canada Shipping Act
Canadian Maritime Commission Act
Canadian National Steamships Act
Government Harbours and Piers Act
Government Vessels Discipline Act
Hamilton Harbour Commissioners Act
Lakehead Harbour Commissioners Act
Live Stock Shipping
Nanaimo Harbour Commissioners Act
National Harbours Board Act

Navigable Waters' Protection Act
New Westminster Harbour Commissioners Act
North Fraser Harbour Commissioners Act
Oshawa Harbour Commissioners Act
Port Alberni Harbour Commissioners Act
Toronto Harbour Commissioners Act
Water Carriage of Goods Act
Windsor Harbour Commissioners Act
Winnipeg and St. Boniface Harbour Commissioners Act

RAILWAYS

Canadian National Railways Act
Canadian National-Canadian Pacific Act
Canadian National Railways Financing and Guarantee Act
Canadian National Montreal Terminals Act
Canadian National Railways Pensions Act
Canadian National Toronto Terminals Act
Government Railways Act
Intercolonial Railway and P.E.I. Railway
Employees Provident Fund Act
Maritime Freight Rates Act
Railway Act



AIR SERVICES

General

With the continued increase in the numbers of larger and faster aircraft of the domestic and international airlines using Canadian airports and facilities, Canada, like most other countries, continued to experience a phenomenal growth in air transportation.

Because of Canada's physical size and geography, this continued growth requires careful planning and effort to ensure that adequate and economical facilities and services are provided in the development and operation of airports, air traffic control, communications and navigational facilities, meteorological services, and proper regulatory procedures in all areas to maintain the highest possible degree of safety.

Close liaison was continued with other government departments, the International Civil Aviation Organization, the International Telecommunications Union, the World Meteorological Organization, and the United States Federal Aviation Agency.

Training—Of the 516 graduates from the Air Services school at the Ottawa International Airport, there were 54 air traffic controllers, 141 radio operators, 33 radio inspectors, 139 radio technicians, 12 monitoring operators, 119 meteorological technicians, and 18 lightkeepers trained in radio beacon maintenance.

Five students were graduated in May in the M.A. course in meteorology given in co-operation with the University of Toronto.

Eighteen trainees were enrolled in a course leading to an M.Sc. in meteorology given by the Department of Meteorology at McGill University and are expected to graduate in the spring of 1963.

The eighteenth course for meteorological officers was given from June to December, 1961, from which of the 31 students enrolled, 15 were graduated.

Three refresher courses were given in December, February and March, attended by 14 meteorologists and 30 meteorological officers.

A combined field training and scientific development workshop was conducted in Halifax and Gander in January, and advanced practical training and forecasting training courses were provided for newly-graduated meteorologists and meteorological officers.

At the end of the year, 16 professional field personnel were enrolled in the correspondence course, *Vector Analysis for Meteorologists*.

Extensive crew training was carried out on the Sikorsky helicopter covering all phases of West Coast operations, including cargo slinging, hoisting and emergency procedures.

Two flying instructor refresher courses were again sponsored by the Department. These courses, managed jointly by the Royal Canadian Flying Clubs Association and the Air Industries and Transport Association, are designed to maintain a high standard of pilot training. A total of 60 instructors were graduated from the two courses.

Of the 3,061 private pilots licensed, 1,802 were trained under the scheme of assistance sponsored by the Department. Forty flying clubs and 82 flying schools participated in this training program.

Airports

Planning and Development—In the continuing development of airports to provide for the increase in all up-weights of large jet air transports and the introduction of medium and large turbo-prop aircraft at an increasing number of feeder and mainline airports, plans have been developed for the extension and/or strengthening of runways, taxiways and parking ramps at St. John's, Nfld.; Sydney and Yarmouth, N.S.; Moncton and Saint John, N.B.; Toronto and London, Ont.; Yorkton, Sask.; Medicine Hat, Alta.; Abbotsford and Terrace, B.C.; Whitehorse, Y.T.; and Cambridge Bay, N.W.T.

Treasury Board has approved in principle the development of new airports at Baie Comeau, P.Q., and Powell River and Pitt Meadows, B.C., and for the expansion of existing airports at 18 sites.

Development of new airports continued at Charlevoix (La Malbaie), P.Q. Toronto Island and Sault Ste. Marie, Ont.; Flin Flon, Man.; and major runway contracts were completed at Sherbrooke and Three Rivers, P.Q., and undertaken, continued or completed at 33 other sites.

In the North, runway improvements were completed at Fort Simpson and Norman Wells, and a terminal building was completed at Inuvik. The volume of civil air traffic at Frobisher Bay airport dropped considerably and, except for routine maintenance, no construction work was carried out.

To meet the problems of greater loads, higher tire pressures, heat and blast from modern jet aircraft, pavement evaluation studies were undertaken for improvement of design and quality control. Load testing was carried out at some 27 airport sites.

Two new airports—Sault Ste. Marie and Prince Rupert—went into operation, and the airports at Timmins and Kamloops were taken over from the municipalities.

Projects for the Department of National Defence included runway construction, lengthening and extending existing facilities, and the provision of taxiways and parking aprons was started, continued or completed at Ottawa and North Bay, Ont., Frobisher, N.W.T., and Cold Lake, Alta.

Surveys were carried out for the development of Air Services facilities at a number of sites, including Yarmouth, Sydney, St. John's, Montreal, Sarnia, Winnipeg, Edmonton, Calgary, Vancouver, and Whitehorse.

Landscaping contracts at Halifax, Montreal and Ottawa progressed, and advanced planning and some landscaping were carried out at Toronto, Winnipeg and Edmonton.

Capital Assistance—A grant-in-aid of \$14,727 was paid to the Community Council of North West River, Nfld., for further development of an airport, and cost-sharing grants of \$68,312 were provided to the villages of Gibson's Landing and Sechelt, B.C., for an airport on the Sechelt peninsula and to the City of Dawson Creek for the further development of its municipal airport. An additional \$15,000 was granted on a cost-sharing basis to North Rankin Nickel Mines, Ltd., for the development of an airport to serve the mining area at Rankin Inlet, N.W.T.

During the year, 57 applications for assistance were received, five for development airports, 38 for local airports, both on a cost-sharing basis, and 14 for grants-in-aid for remote airport development. Of these, only two local airport proposals and one remote site were approved in principle. In the rest of the applications, either the sites were not suitable, the economic need was insufficient or the local interests did not accept the obligations to be met where assistance might otherwise have been warranted.

Subsidies—Operating subsidies were paid for the airports at Trenton, N.S.; Saint John, N.B.; Forrestville and Riviere du Loup, P.Q.; Timmins, Ont.; Brandon and Dauphin, Man.; Beaverlodge and Prince Albert, Sask.; Medicine Hat, Alta.; and Campbell River and Kelowna, B.C.

Operational Requirements—Evaluation of the visual approach slope indicator system installed on one runway at Montreal last year has been completed and the system has been recommended for installation at other airports. Transmissometer and ceilometer installations were completed in Ottawa, Toronto and Montreal, and installations were started at Gander, Halifax, Winnipeg and Vancouver. This equipment will provide improved end-of-runway weather information and will be of value to aircraft instrument operations.

Aircraft noise continues to be a significant problem and the Department, as operator of most of the major airports, is endeavouring to safeguard the interests of all concerned. At Montreal, jet aircraft operations between midnight and 7 a.m. are prohibited. Noise monitoring continues and individual attention is given to airline operations that exceed reasonable noise levels.

Major Terminals—Overall progress on the major terminals construction program was satisfactory except where work was slowed down by strikes in the construction trades. At Toronto, reasonably good progress was made in the construction of Aeroquay #1, major contracts were awarded and work progressed satisfactorily on a project for site services, including car parking area, roads, water mains, bridges, an administration building and a control tower.

At Edmonton, contracts were completed for a terminal services building, foundations, structural reinforced concrete ground floor slab and structural steel for the terminal, and the provision of sewage lagoons and associated work. The general building contract was awarded in September 1961, with completion expected in the late summer of 1963.

At Winnipeg, the general finishing contract was awarded in April 1961, with completion expected early in the spring of 1963.

Consultants were engaged and planning started for the provision of a new terminal for the Vancouver International Airport.

Standard Terminals and General Buildings—Tenders were called for terminal buildings at North Bay and Sault Ste. Marie, Ont.; Fort McMurray, Alta., and Penticton, B.C., and plans and specifications were completed for terminals at Victoria, B.C., and Whitehorse, Y.T. Sketch plans were prepared and approved for terminal buildings at Lakehead, Fort Nelson, Kamloops, Fort Smith and Yellowknife, and are under preparation for Moncton, Fredericton and London. Revised sketches were requested from the consulting architects for Sault Ste. Marie.

Major projects completed were: nine double staff dwellings and single men's quarters at Goose Bay, Lab.; central heating system at Montreal; heating plant and power house at Quebec; three double dwellings and one single dwelling at Kenora; a power house at Regina; prefabricated air terminal building at Prince Rupert and one at Inuvik; combined maintenance garage, firehall and airport services building at Edmonton; a prefabricated mess and recreation building at Resolute Bay, N.W.T.; maintenance garage at Fort Smith, N.W.T.; prefabrication and erection of buildings at Cambridge Bay, N.W.T.; and maintenance garage at Williams Lake, B.C.

Various radio buildings were completed at Canso and Halifax, N.S.; Robin Hood Bay, Nfld.; Moncton, N.B.; Sault Ste. Marie, Wiarton, Aylmer and Cardinal, Ont.; Frobisher Bay, N.W.T.; and Fort St. John and Sandspit, B.C. Similar projects were under way or completed at 24 other sites.

Power and Lighting—Airport lighting facilities were in various stages of completion at 22 sites, and the establishment of power facilities was carried out at 21 locations.

Refuelling Systems—The hydrant refuelling system was completed at Montreal and work is under way on a similar type of installation at the Toronto International Airport.

Field and Surface Maintenance—A combination of experience and improved methods and equipment has successfully met the high standard surface maintenance requirements of jet and turbo-prop aircraft, which must have runways completely free of sand, ice and debris. This is achieved by continual operation of high speed runway sweepers and plows, combined with snow blowers. New types of plows and more efficient longer-life brooms and new techniques are being developed.

Runway ice and its control has always been a problem, and considerable research is being carried out to combat this hazard. A machine which heats sand and water and distributes the mixture onto the ice surface is in the testing and modifying stage and has displayed very promising results.

Weed and brush control, essential for property care, the proper function of drainage facilities, preventing noxious weeds from spreading, and for fire control, presents a difficult maintenance problem at many sites. The test series plots instituted in co-operation with the Department of Agriculture across Canada is in its second year and is already a source of valuable information.

Maintenance Equipment—One hundred and forty-seven pieces of major airport equipment, such as trucks, snow blowers, graders and runway sweepers were purchased, either to replace worn out equipment or as additional requirements to handle expanded runway, ramp and apron surfaces completed at the larger airports. Several airports are now equipped with new high-speed snow drags, which eliminate much of costly snow plowing. Two airports are equipped with truck-mounted aerial platforms, which are in constant use for maintaining overhead lighting, space heaters in hangars and antennae, and truss inspection.

New maintenance garage facilities provided at a number of airports during the past year have resulted in an improved standard of equipment maintenance.

Fire Losses—Fire losses increased from \$77,956 in 1960 to \$110,002 in 1961. The radio range building fire at Yellowknife on July 19, 1961, was responsible for \$92,500 of the total loss.

In an effort to effect a significant reduction in fire losses, Headquarters Fire Services is now comprised of a fire marshal, a fire standards officer, a fire equipment officer, and a fire training officer. Each Region also has a fire prevention officer, part of whose duties is to make a periodic fire inspection of all Air Services buildings and to conduct a fire prevention educational program among Air Services employees.

Airport Licences—At the end of the year, there were 546 airport licences in force, an increase of 49 over the previous year.

Airport Revenue—Revenues totalled \$14,677,864, compared with \$11,384,755 the previous year. This increase is due in part to a general increase in the number of landings and to a full year's operation of the larger aircraft that were introduced in 1960.

Air Traffic Control

Aircraft movements controlled by the Department's 31 airport traffic control towers totalled 2,408,972 in 1961, a decrease of 14.7 per cent from last year. There were 15 terminal control units in operation, providing separation to aircraft in accordance with the Instrument Flight Rules within specified areas, usually within a 30 or 40 mile radius of the airport. The eight area control centres handled 2,849,964 fix postings, 675,593 IFR (Instrument Flight Rules) flight plans, and 222,444 VFR (Visual Flight Rules) flight plans.

Aircraft

Civil aircraft registered at the end of the year showed an increase of 486 over the previous year. Of the 5,915 registered, 3,739 were private, 1,995 were commercial, and 181 were State. Individual totals for the previous year were 3,358, 1,864 and 207 respectively.

Airmen Licences

There were 21,306 airmen licences in force at March 31, classified as follows: Pilots—glider, 506; private, 14,231; commercial, 2,100; senior commercial, 383; airline transport, 1,316; air navigators, 90; air traffic controllers, 781; flight engineers, 45; and aircraft maintenance engineers, 1,854.

Air Regulations

Infractions of the Air Regulations resulted in 86 prosecutions as compared with 94 the previous year.

Aircraft Accidents

During the calendar year 1961, there were 319 accidents, excluding minor incidents, with 75 fatalities. This was an increase in the ratio of accidents to the number of commercial aircraft registered and 18 more fatalities.

Air Carriers

Of the 635 commercial air carriers operating the various types of air services in Canada, 384 were Canadian and 251 were Foreign and Commonwealth.

Flight Operations

At the end of the year, the Department was operating forty fixed-wing aircraft and 19 helicopters. During the year the fleet was increased by one Lockheed JetStar, one Sikorsky helicopter, two Bell helicopters and three Beech 18 aircraft. The JetStar is used primarily to familiarize departmental pilots with jet aircraft operations and to provide for additional evaluation of radio aid characteristics at high altitudes, as well as high speed transportation. The Sikorsky helicopter is used mainly for transporting supplies to lighthouses on the West Coast.

In addition to routine maintenance, the aircraft maintenance and overhaul base at Ottawa airport carried out 64 engine changes, 10 overhauls of fixed-wing aircraft, and 11 helicopter overhauls.

Aeronautical Engineering

Three aircraft type approvals were issued and nine were revised to cover changes in the aircraft configuration. Work continued with the certification of one rotary-wing and one fixed-wing type aircraft, and type certification was completed for one fixed-wing aircraft type after almost four years' work. Seven supplemental type approvals were issued and one was revised, all covering design changes to existing aircraft type.

In connection with technical supervision over all civil operators and manufacturers, aircraft inspections increased by 36 per cent to a total of 4,231, and visits made to manufacturers, repair and overhaul organizations increased by 20 per cent to a total of 1,283.

One company approval was granted, bringing the total of approved companies to 45; twelve were revised to approve expanded facilities.

Air engineer examinations totalled 724.

Canadian airworthiness standards to cover STOL/Bush airworthiness are being prepared, and homebuilt aircraft requirements are under revision.

The Canadian Airworthiness Council, under the chairmanship of the Chief Aeronautical Engineer, met twice and made recommendations for changes in aircraft inspection, certification and airworthiness requirements.

Radio and Television

Licensed radio stations in Canada numbered 79,329, an increase of 11,587 over the previous year. This number included stations operated by federal, provincial and municipal government departments, stations on ships and aircraft registered in Canada, and mobile stations operating in the public and private land mobile services.

Applications for new private commercial broadcasting licences totalled 56, of which 40 were for AM sound and 16 for FM. There were 209 applications from existing private commercial broadcasting sound stations, 60 of which were for changes in facilities and 149 for transfers of stock, change in ownership or change in name of licensee. Sixty-three applications were received for new private commercial broadcasting stations (television) licences, and 24 for changes in facilities of established private commercial broadcasting stations (television).

Forty-six private commercial broadcasting stations (sound and television) commenced operation during the year, and 30 applications were received and approved for unattended operation of broadcasting stations using supervisory control systems.

To meet increased public interest in stereo Hi-fi and FM broadcasting and as a result of the development of a satisfactory multiplexing system for producing stereophonic FM broadcasting and reception, the promulgation of the Department's rules for stereophonic FM broadcasting in September introduced a new medium of private commercial broadcasting in Canada. Since then, five multiplex FM stereophonic broadcasting systems have come into operation and other FM stations are now including this system in their plans.

The implementation of new, and changes in the status of existing, radio standards specifications, resulted in the number of requests for radio equipment type-approval increasing approximately 70 per cent over the previous year. This included an increase of approximately 15 per cent in the number of test reports submitted by the Radio Regulations engineering laboratory, resulting in more than 1,000 units being approved during the past year.

Fifty-six radio transmitters and receivers were examined in the laboratory for type-approval under various radio standards specifications, and for equipment and method of measurement evaluations purposes. In addition, 15 special engineering projects were undertaken on various problems related to the technical aspect of spectrum management.

Investigation of electronic equipment operating in the super high frequency and very low frequency bands presented many problems which required developing new techniques in measurement using specialized test equipment.

The Systems Engineering Group dealt with approximately 250 engineering briefs and licence applications covering HF, VHF, UHF, and SHF point-to-point radio systems. Prelicensing co-ordination procedure involved processing approximately 46 technical submissions. Compatibility studies were completed for 94 microwave systems, which included civil and military systems and radars.

A transcontinental microwave system under joint development by the Canadian National and Canadian Pacific Railways involved numerous technical studies

and co-ordination meetings. The low frequency groups selected 37 beacon frequencies, which included the co-ordination of 28 United States beacons.

The Space Systems Group, established in December, studied various satellite communications proposals and their impact on existing and projected radio telecommunications systems, and held consultations with other government agencies and industrial associations to co-ordinate the views of these groups on space communications.

Inspection and Interference Suppression

To ensure compliance with Canadian laws and international conventions and treaties, radio regulations inspectors, operating from 30 field offices throughout Canada, conducted surveys and inspections of 21,117 radio and TV stations of various classes.

Extensive liaison was maintained with manufacturers and distributors of aviation and marine radio equipment, and with organizations using, installing, repairing or overhauling such equipment, to promote the effective application of acceptable practices in keeping with specifications and standards set by the Department. Forty-two breaches of the Radio and Canada Shipping Acts were investigated and 10 Court actions were instituted.

Examinations

Examinations for certificates of proficiency in radio totalled 8,162, and 8,239 certificates were issued.

Research, Development and Programming

A specification for remote weather briefing systems for major airports, including operational characteristics, was approved for design and construction purposes, and the results of the feasibility study of unattended marine beacons were accepted for further action by the design and construction division.

An experimental system of using closed circuit television techniques for airport surface surveillance has been installed at Toronto International (Malton) airport for technical and operational evaluation, and an experimental system of applying compressed bandwidth technique to data transfer from radar to television presentation is being evaluated at Ottawa airport.

Space Systems—Preliminary to Canadian participation in the Nimbus project, a theoretical study was conducted, and suitable sites in Eastern Canada were selected for the terrestrial portion of electronic facilities for the Nimbus satellite system.

Studies to determine the feasibility, capability and reliability of a space satellite communication system were conducted, and research and development in this field, leading to the development of an earth-space communication facility, is continuing.

A project team of two engineers from the Telecommunications and Electronics Branch, and one from the Canadian Overseas Telecommunication Corporation was assigned to the British Post Office and is participating in the space satellite communications experiments being carried out jointly by Britain and the United States.

Radio and Radar Aids to Navigation

The marine station at Midland was combined with the Wiarton aeradio station, providing improved marine communications in the Bruce Peninsula and at the same time effecting an economy in operation.

The marine radio coast stations renovation program is 75 per cent complete. New transmitter buildings and antenna farms were provided at the following marine stations: Yarmouth, Canso and Halifax, N.S.; St. John's, Nfld.; Port Harrison, P.Q.; Kingston and Lakehead, Ont.; and Vancouver and Prince Rupert, B.C. New high-powered transmitting equipment, capable of future single sideband operation, will be installed in these buildings in 1962 to improve communications with ships at sea.

At the marine radio stations at St. John's, Nfld.; Halifax, N.S.; Alert Bay, Sandspit, Vancouver, and Prince Rupert, B.C., new remote receiver buildings and antenna farms were provided to improve incoming marine communications reception.

The thirty-year-old marine radio control building at Canso, N.S., was replaced by a new building erected on the same site, with receiving facilities also relocated there.

The program of providing lighthouses throughout the country with transistorized radiotelephones is now 75 per cent complete.

Seventy-five portable VHF "walkie talkies" were obtained to improve the efficiency of the pilotage service on the St. Lawrence River.

The marine radiobeacon at Gros Cap, Ont., was modified to make it suitable for both aviation and marine operations, and a radiobeacon was installed at the Port Arthur main light.

Maintenance and operation of the Nova Scotia and East and West Newfoundland Decca Navigator Chains were taken over from Computing Devices of Canada, and Chain 9 was moved from St. Raymond, P.Q., to Anticosti Island.

VHF/FM radiotelephone were installed on 28 Canadian Coast Guard ships, and the program to equip all CCG vessels with VHF communications will be completed in 1962. New high frequency AM radiotelephones were installed on eight vessels and 23 launches associated with the larger ships.

The program to provide high frequency single sideband equipment on Canadian Coast Guard vessels has been delayed because suitable equipment is not available. In the meantime, CCGS *Camsell* and NSV *Mink* were installed with special equipment as the requirement had become urgent.

New Very High Frequency Omni range (VOR) facilities were commissioned at Halifax; Fredericton; St. Eustache and St. Jean, P.Q.; Yorkton; Saskatoon; and Vermilion, Alta., and the VOR at Montreal International airport was decommissioned. The VOR airway across the Rocky Mountains is progressing, with site selections completed at Princeton and Kimberley, B.C. and site preparation commenced at Enderby, B.C.

Preparations are well under way for co-locating TACAN (Tactical Air Navigation) facilities at 22 VOR sites, and building alterations to accommodate TACAN equipment was started at 14 sites. Arrangements were completed with the RCAF for the Department to flight check 34 TACAN installations on a routine basis, in addition to maintaining the installations co-located with VOR's.

New Instrument Landing (ILS) facilities were commissioned at Sault Ste. Marie, Penticton and Montreal, the latter including the first directional localizer

waveguide antenna in Canada. Sites were selected at Carp, Frobisher, Calgary, Port Hardy, and Whitehorse, and a temporary ILS was commissioned at Frobisher. Relocated facilities were commissioned at Vancouver, and obsolete equipment was replaced at Montreal and Winnipeg. New module-type buildings were designed for all ILS transmitters, and a remote control link was installed for control of Dartmouth ILS from Halifax International Airport.

New aeradio stations were commissioned at Sault Ste. Marie and Prince Rupert, and the marine facilities at Vancouver were relocated and combined with the aeradio station.

Point-to-point radiotelephone facilities with connection through commercial telephone lines at North Sydney were commissioned between that point and fish plants at Burgeo, Ramea and Gaultois on the south coast of Newfoundland, and a radioteletype circuit was established between Sable Island and the Halifax Meteorological office.

With the establishment of a commercial wire company office at Dawson, handling of commercial traffic to privately owned out-stations was passed over to the company concerned.

Plans for moving the southern terminal of the Northwest Territories radio teletype network from Edmonton to Fort Smith was 90 per cent completed. During 1962, the radio teletype circuits from Inuvik, Norman Wells and Fort Simpson will be re-routed into Fort Smith, with extensive equipment modernization.

Plans for converting many of the Department's Morse communications systems to single sideband operations was 70 per cent completed. This conversion program, scheduled for completion during 1963-64, will result in a more economical operation as lower qualified personnel can be employed to staff isolated stations.

Automatic error correcting equipment has been added to the Cambridge-Resolute Bay (NWT) and Gander, Nfld.-Birdlip, Eng., radio teletype circuits. Since the introduction of this equipment, there has been a marked increase in the reliability of both circuits.

A new remote receiver site was commissioned at Resolute Bay, and new transmitter buildings were completed at Winnipeg, Toronto and Frobisher.

Plans were completed and equipment ordered for the permanent extended range and long range VHF aeronautical communications stations. Extended range systems planned for Gander (St. Lawrence), Knob Lake, P.Q. and Edmonton (McMurray), and long range for Gander, Goose, Mont Joli, and Frobisher should be in operation by September 1963.

Direct air traffic controller to pilot VHF communications systems were provided at Yarmouth, N.S. (Moncton), Sherbrooke (Montreal), and Empress, Alta. (Edmonton), under control of the Air Traffic Control Centre shown in brackets. A similar system was provided under the control of Moncton aeradio station to reduce the staffing required at Yarmouth to provide International Civil Aviation Organization VHF communications for aircraft passing over the latter station.

Development and design of a new communication control system for airway traffic control communications, as well as aeradio and marine communications, was 75 per cent completed. Renovation was necessary because of greater complexity in sharing communication facilities and because of the general increase in the traffic handled.

Aeronautical radiobeacons were installed at Three Rivers; Thompson, Man.; Davin, Sask.; Coulee, Peace River, and Standard, Alta.; Prince Rupert; and Fort Simpson and Cambridge Bay, N.W.T.

A review of existing radio navigation aids and services resulted in 11 radio ranges being downgraded to non-directional radiobeacons, and at another location the navigational aid was changed to an unattended facility.

Radar—An AASR-1 (surveillance) radar was commissioned at North Bay, one unit is under construction at a site near London, and a link at Goose Bay is nearing completion. Precision Approach Radar (PAR) was operating at Gander and Toronto, and installation commenced at Montreal. A secondary surveillance radar system, to be used for evaluation purposes, was installed at Ottawa airport, and a specification was completed for the purchase of 16 more.

A data link and radar display equipment were installed at Goose to display the military radar picture in the ATC Centre. The ASR-3 radar and the PAR-2 radar display equipment at Gander were relocated from the IFR room to the ATC Centre, and a second PAR console and antenna simulator were added to the system.

A contract was awarded for seven radar bright display systems to be installed at Gander, Moncton, Montreal, Toronto, Winnipeg, Edmonton and Vancouver, and equipment was obtained for installing this system at the Montreal control tower.

Two harbour surveillance radars were obtained for installation at Camperdown, N.S., and Les Escoumains, P.Q.

MR-75 radars were modified for weather radar installations at Quebec, Ottawa and London, and installation was completed at Ottawa. Contracts were awarded for "C" band weather radars for Halifax, Toronto, Winnipeg, Edmonton, and Meteorological research.

Landlines

To effect the interconnection of two air traffic control interphone circuits at North Battleford, and also at Crescent Valley, remote control switching facilities were provided, and a leased cardatype system for flight plan distribution was installed in the Toronto Area Control Centre.

At Fredericton, Regina and Edmonton push-button switching equipment was extended to include control tower and terminal control units, and similar equipment was rearranged at Gander when the terminal control and area control centre were amalgamated.

The air traffic control circuit between Toronto and Detroit was equipped with two-digit signalling, and orders were placed for similar facilities on the Montreal-Moncton circuit and on several trans-border circuits in co-ordination with the United States Federal Aviation Authority.

New air traffic control interphone circuits were leased between Moncton-Greenwood and Sault Ste. Marie, Mich.-Sault Ste. Marie, Ont., and an extension of the air traffic control network to Yellowknife via Fort Smith, Resolution and Hay River were ordered.

The air operational teleprinter network was extended from Terrace to Prince Rupert and a second circuit was commissioned between Vancouver and Terrace. A new circuit was established between Montreal and Gander via intermediate

service points. The Vancouver-San Francisco circuit was speeded up to 75 words per minute, and teleprinter services were established at various locations for Exercise Tocsin B.

A voice interphone circuit was established between the Vancouver Rescue co-ordination centre and marine coast stations at Vancouver, Victoria, Gordonhead, Cape Lazo, Tofino, Alert Bay, Sandspit, and Prince Rupert, and also the Prince Rupert Marine Agency.

A combination voice-facsimile service for handling ice reconnaissance maps and data under regular telephone toll lines were negotiated for part-time use between Seven Islands-Halifax and Sydney-Halifax.

Weather teleprinter and weatherfax networks were ordered to be extended from Edmonton to Yellowknife via intermediate service points, and teleprinter equipment was leased for use on the Halifax-Sable Island radio teletype circuit.

Message Centre

A total of 80,327 teletype, commercial telegram and telex messages were handled, an increase of 4,766 over the previous year.

Government Telegraph and Telephone Service

In Nova Scotia, new submarine cables were laid between Blandford and Ironbound Island, and between John's Island and Ellenwood Island in the Tusket Islands group. Submarine cables between Woods Harbour and Forbes Point, Barrington and Cape Sable Island, and Blandford and Ironbound Island were sold to the Maritime Telegraph and Telephone Company Ltd., and the one between the Cape Sable lightstation and The Hawk was transferred to the Aids to Navigation Division of the Department's Marine Works Branch.

Disposition of the remaining parts of the system, consisting of six sections of submarine cable totalling 3.3 miles in Nova Scotia and the small power plant on Pictou Island, used for radio link service to the mainland, is under way.

Emergency Measures Planning

Planning items under the Emergency National Telecommunications Organization included developing policy as to the type of regulation necessary for controlling emissions during wartime, developing a plan for an emergency network for broadcasting warning and instructions to the public, and developing a priorities register system for cataloguing the Nation's essential private leased line service for use in restoring facilities during an emergency.

The Telecommunications and Electronics Branch participated in two National civil defence exercises—TOCSIN and TOCSIN B—and emergency sites were manned for both exercises. Staff members attended courses on Government survival training.

Meteorological Services

Forecasts of expected weather conditions for the next two days were issued four times daily for all populated regions throughout Canada, and forecasts of particular interest to mariners were issued regularly for Canadian coastal waters and inland waterways. Separate forecasts were provided for major metropolitan

centres. General forecasts were supplemented by specially prepared forecast advice for agriculture, forestry, industrial and government interests.

Ice-forecast and advisory services were provided for marine operations in the ice-infested waters of the Gulf of St. Lawrence, Cabot Strait, Strait of Belle Isle, Newfoundland and Labrador coastal waters, Hudson Bay and Strait, and in Arctic areas where shipping was engaged in annual resupply of weather stations and other sites.

Warnings were issued when hazardous conditions, such as freezing rain, heavy snow or rain, blizzards, gales and severe cold, were expected to endanger life and property, and marine warnings were issued when wind speeds of dangerous intensity were expected. These warnings were provided direct to conservation authorities, public utilities and defence organizations, and were widely distributed through the press, radio and television.

Weather Information—Public interest in weather subjects steadily increased and, wherever possible, pertinent publications were supplied in answer to queries, and leaflets were made available to provide information on particularly popular weather topics.

The inclusion of meteorology in secondary schools science curricula and the higher grades in primary schools has resulted in an increasing demand from both teachers and students for publications on weather.

Assistance was also provided for writing articles on weather and weather services for publication in periodicals and the press. Staff members continued to be called upon to assist in the instruction of organizations whose studies included meteorology, and to address service clubs, scientific organizations and church groups on meteorological topics. Individual and group tours of weather offices were conducted, and a weather display was presented at the Canadian National Exhibition.

Expanded Services

New forecast regions and regional boundaries were introduced in Eastern Canada to provide more accurate and detailed forecast services in this area.

An agrologist from the Alberta Department of Agriculture was assigned to the Edmonton Forecast Office to prepare special weather bulletins and advice for Alberta farmers during the growing season.

A St. Lawrence weather bulletin consisting of weather reports from coastal stations along the St. Lawrence and East Coast was broadcast daily from Mont Joli marine radio station as a service to mariners operating in that area.

Aviation Weather Service

In addition to forecasts issued four times daily for aerodromes and aviation regions covering most of Canada, forecasts for the North Atlantic and for a strip across southern Canada were provided to serve trans-Atlantic flights at medium and high altitudes and trans-continental jet flights. These forecasts were issued in chart form by the Principal Forecast Office at Montreal International Airport and distributed by facsimile.

Exchange of Area Forecasts—Under agreement with the United States Weather Bureau for exchange of area forecasts, arrangements were made to obtain

by facsimile routine forecasts covering routes to Asia, Honolulu, Central America, the Caribbean and the United States, thus eliminating duplication in Canadian offices.

Warnings—The meteorological offices at Goose and Gander undertook issuing notices of expected or reported occurrences of certain defined weather phenomena important to aircraft in flight. This is a pilot project on which to plan expansion in area of coverage and contents.

Pilots' Reports—In co-operation with the Civil Aviation and Telecommunications and Electronics Branches, procedures were set up to encourage increased weather reporting in flight by domestic aircraft, and distribution of such reports by radio.

Communications

The 54,000 mile meteorological teletype circuit expanded to 354 stations served by 542 connections, and 21 offices were added to the system.

Two major changes were made, one of which increased the capacity of express circuit Washington-New York-Montreal by converting it to full duplex operation, and the other replaced, by leased circuits, line facilities in Newfoundland which had been operated by the United States Government since the middle of World War II.

The Canadian weatherfax system during the fiscal year had 14,700 air-line miles of circuit serving 71 stations equipped with 87 connections. Six stations were added to the system and two existing establishments were each equipped with a connection to the United States Weather Bureau's level facsimile system.

Research

An advisory committee consisting of representatives of the Defence Research Board, the National Research Council, the Ontario Research Foundation, and the Meteorological Branch considered 16 applications for grants totalling \$172,000 to aid meteorological research in Canadian universities. Of this number 11 were recommended for support in the fiscal year 1962-63.

Air Pollution—Assistance to co-operating organizations interested in air pollution continued, including the Occupational Health Division of the Department of National Health and Welfare, Atomic Energy of Canada Ltd., the provincial governments of Nova Scotia, New Brunswick, Quebec, Ontario, Manitoba, Saskatchewan and Alberta, the cities of Hamilton and Vancouver, the National Research Council, the Ontario Research Foundation, and the St. Clair River Research Committee.

The 150-300 foot micrometeorological installations at Ottawa, Chalk River, Des Joachims, Sarnia, Detroit (WJBK television tower), and Resolute continued in operation, and new towers were installed in Hamilton and Montreal.

The portable 80-foot tower, obtained last year for field studies of pollution diffusion, was used at the Douglas Point site of the Atomic Energy of Canada Ltd. Results of data obtained from the tower and from research ship CCGS *Porte Dauphine* are contained in *The Micrometeorology of Douglas Point, Ont.—Progress Report No. 1*.

Ozone—The ozone research program continued with observations at Edmonton, Resolute and Scarborough. Observations were discontinued at Moosonee in June and the equipment was moved to Goose Bay where an observing program was started in December.

Radiation—The number of stations in the solar radiation network remained unchanged—29 in addition to the National Radiation Centre. Instrument facilities were improved, and two net radiometers were installed at stations outside Toronto, marking the beginning of a sub-network expansion of instruments measuring net radiation.

Radiation equipment was calibrated, and in several instances provided, for Canadian research groups, including the Jacobsen-McGill Expedition to Axel Heiberg Islands; the Barnes Icecap Project, Baffin Island; and the Tobacco Fleck Project at Port Burwell.

Cloud Physics—The precipitation physics project completed its third year of investigating precipitation mechanisms and assessing the effect of silver iodide seeding of major weather systems by aircraft over relatively flat terrain. The precipitation collecting network was automated in 1961 by installing recording raingauges at all rainfall measuring stations.

Synoptic Meteorology—Intensive research of turbulence affecting aircraft was carried out, with two aspects of the problem receiving special attention. A definitive study of clear air turbulence at high levels was completed and a forecast scheme developed for this phenomenon. Turbulence affecting aircraft in the lower 1,500 feet was investigated from a theoretical and observational point of view, in a continuing project.

Preliminary planning and studies were carried out on a micrometeorological project designed to develop techniques for making highly accurate short-period forecasts of ceilings and visibilities at airports. This will become an increasingly important requirement with the advent of supersonic aircraft.

Numerical Weather Prediction

Numerical weather prediction and analysis methods continued, using high-speed electronic computers. Authority was received for the installation of a large high-speed electronic computer for the introduction of an operational numerical weather prediction program in the fiscal year 1962-63. The objective is to improve the accuracy of weather forecasts and to handle more effectively the large quantities of data required in modern meteorological services.

Hydrometeorology

Studies of critical meteorological factors contributing to maximum flood flows were conducted for both the Fraser and Columbia rivers, and work continued on major research projects concerning the Quebec north shore area and the Saint John River basin. This required investigations of the rainfall production of major historical storms in Canada, and 96 of these studies were published in the Storm Rainfall in Canada series.

In co-operation with the Great Lakes Institute, University of Toronto, research on meteorological factors affecting the Great Lakes and the effects of the lakes on weather and climate continued. From data collected from the research ship,



Pleasure boating on the
Canal.



SS *Federal Maple*, Canadian
gift to the West Indies
Federation.



CCGS *Eckaloo*—Mackinac
River shallow draft buoy
vessel.

Department helicopter on ice
survey in the Gulf of St.
Lawrence.

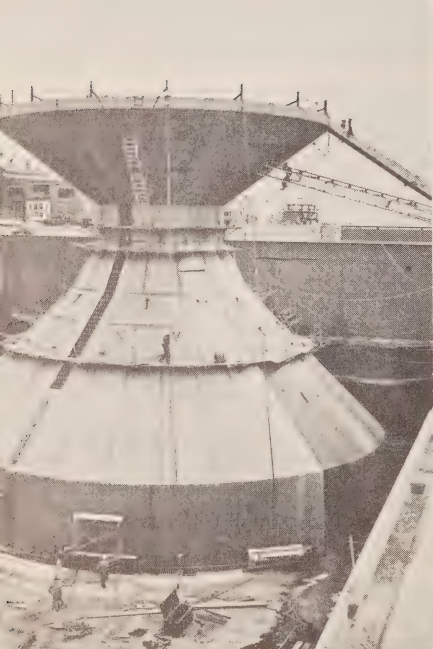


Ice breaking in the Gulf of St.
Lawrence, February 1962.



Telescopic aluminum hangar
designed by DOT to house
helicopters aboard Canadian
Coast Guard ships.

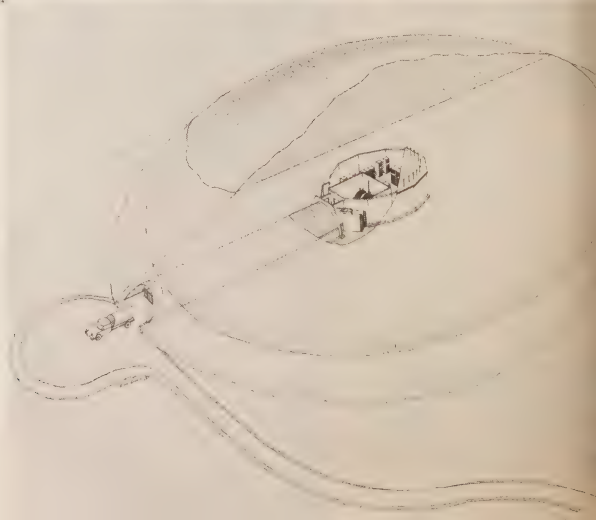
Erecting mast at automatic weather station—Axel Heiberg, N.W.T.



Above—Caisson for the lighthouse to be constructed at Prince Shoal, P.Q.



Right—Artist's sketch of world's first underground mountain-top VOR station under construction near Enderby, B.C.





Mobile aircraft noise monitoring station
—Montreal International Airport
(Dorval).



Art at Halifax International Air
Terminal: *Above*—"Three Canadian
Geese", sealskin stencil by
Innukjuakjuk (Cape Dorset 1960
collection); *Left*—Decorative screen
"Wings and Fins" by E. B. Cox.



Centre photo—Gulf Ice—February 1960



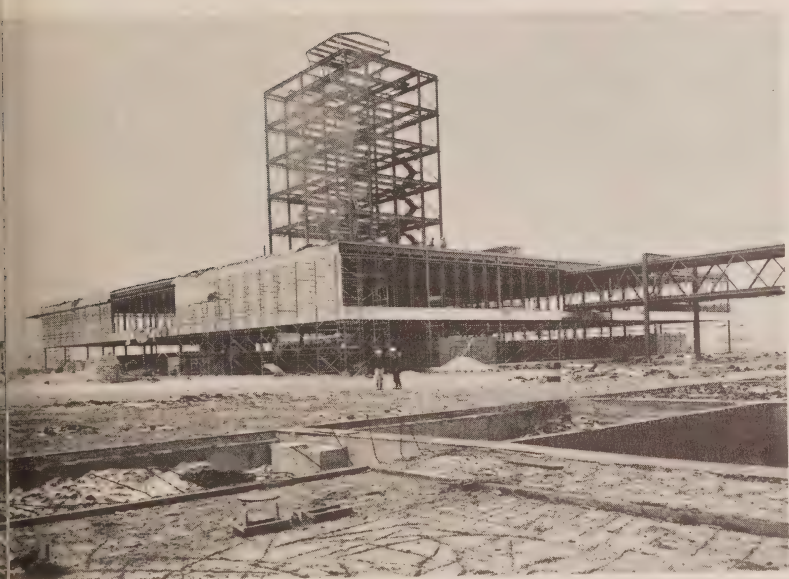
Aircraft of the DOT f
front of the new mainte
hangar at Ottawa ai

D.O.T. JetStar.



Sikorsky S-62 for light
supply and search and re
on the West Coast.

g day at Trois-Rivières
October 22, 1961.



Air terminal construc
at Winnipeg Internati
Airport.

Lighting at Edmonton
Airport.



CCGS *Porte Dauphine* and from observation towers in the Great Lakes, the Hydro-meteorology Section prepared or published five research papers.

A co-operative program to study the water balance of the eastern Rockies watershed area was undertaken. The Marmot Creek basin, a small watershed near Kananaskis, Alta., was equipped with meteorological instruments to be used in this long-term program in which the federal Departments of Forestry and Agriculture, the Eastern Rockies Forest Conservation Board, and a number of Alberta agencies are participating.

Arctic Climatology

Reports were completed on freezing and thawing indices in Northern Canada and on terminal weather conditions at selected northern airports, and projects under way include the extension of the freezing and thawing degree computations to central and southern Canada and an analysis of the frequency of specified minimum temperatures at representative stations.

Microclimatology

Research on microclimatological conditions affecting fruit growing in areas north of Lake Erie, started last year in collaboration with the Ontario Research Foundation, continued, and a similar study of the area east of Lake Huron was begun.

Arctic Weather Stations

Special scientific projects at the Joint Arctic weather stations included measurement of tides and sea-ice thickness, observations of snow temperature gradient and the physical characteristics of snow, both surface and profile. Soil temperature measurements to a depth of 650 feet, and measurements of radiation, turbulence and ozone continued at Resolute.

Upper Air Observations

In a concentrated effort to improve both the heights reached in upper air observations and the quality of the observed data, radiosonde instruments at all stations, except the Pacific Weather Ships, were converted to one basic type. A series of performance tests on every type of aerological balloon available showed a marked deterioration of height attainment during the winter months, regardless of balloon conditioning and filling procedures, rates of ascent and other factors involved. As a result of these tests, balloon manufacturers are working on the development of a fabric that will give improved performance under the severe winter conditions of the Canadian north.

Meteorological Inspections

In the meteorological inspection program for maintaining uniformity in methods of observation and in instrumentation at observing stations in accordance with the World Meteorological Organization procedures, inspections included 858 synoptic, aviation and climatological stations, and 886 visits to stations to install new equipment, service, repair or replace instruments, and to make surveys to determine the suitability of proposed observing sites.

Ice Reconnaissance and Observing

The aerial ice reconnaissance and observing program to aid shipping, begun in 1956-57, was continued and expanded. A total of 3,650 hours was flown, compared with 2,700 hours the previous year.

In the Gulf of St. Lawrence and coastal waters of Newfoundland and Nova Scotia, 93 flights totalling 648 hours were carried out from April 1 to June 29, from bases at Gander and Sydney. Operations were extended to cover the Labrador coast as far north as Cape Chidley during the spring and early summer.

From January 6 to March 31, 1962, 79 missions were completed in the St. Lawrence River east of Quebec, the Gulf of St. Lawrence and the coastal waters of Newfoundland. Because of expanded activity and severe ice conditions, three chartered aircraft, based at Gander, Sydney and Seven Islands, were used simultaneously.



MARINE SERVICES

Aids to Navigation

Buoys, beacons and markers of all types maintained on coastal and inland waters totalled approximately 11,200. Of these, 951 were light buoys, 121 sound buoys and 312 light and sound buoys. In addition, there were some 400 contracts in force for the maintenance of minor buoys, bushes, stakes and other markers in secondary channels and isolated areas. These are checked periodically by Marine Agency inspecting officers.

The program of converting oil-burning lights to modern automatic types was continued, the total at the end of the fiscal year numbering 2,736, compared with 2,518 the previous year.

Construction

Engineering design for the new lighthouse pier and superstructure at Prince Shoal, P.Q., was completed. The first contract for the construction of the crib was awarded and 50 per cent completed.

In the program of providing aids for the St. Lawrence Seaway channels, two new light piers were constructed in the Detroit River near Amherstburg, Ont. A contract awarded for the construction of 10 light piers for the new Southeast Bend navigation channel in the St. Clair River, Ont., was 50 per cent completed.

Soil investigation programs, including borings, were carried out in the Beauharnois Canal, Lake St. Francis and Lake St. Louis to determine foundation conditions for proposed marine works.

Forty-nine new dwelling units, nine fog-alarm buildings, and nine lighthouse towers were constructed by contract under the supervision of departmental engineers, either to replace obsolete lightstation structures or to provide additional dwelling accommodation.

Contracts were awarded for the construction of a new Agency Depot wharf at Charlottetown, P.E.I., and for dredging and extending the Marine Agency wharf at Dartmouth, N.S.

Final design of the new office and stores and shops buildings at Prescott, Ont., and Prince Rupert, B.C., and the preliminary design for a new Agency wharf and buildings at Victoria, B.C., are under preparation.

A new pilotage building was constructed at Pointe des Ormes, and a contract was awarded for a new wharf and pilotage building at Anse aux Basques, P.Q.

In addition to these major projects, several minor lighthouse towers were constructed, and the regular repair program was continued.

Electrical and Mechanical Equipment

The program of electrifying oil and battery-operated unattended lights, when commercial power becomes available, was continued. At several important stations around the coast, the intensity of the lights was improved considerably by installing rotating beacons. The photometric equipment acquired for the Prescott Agency was put into service to measure more accurately the intensity of the various types of lights used. Remote control equipment designed in conjunction with the National Research Council was under test at the Prescott Depot and will ultimately be used at Pelee Passage light and fog alarm station. A proportional charging unit was designed and put into service at the front range light at Beauharnois, P.Q.

A light and fog alarm were established at Bar Point, P.Q., equipped with a rotating beacon and electric fog horn. The fog horn is controlled by conductors included in a special submarine cable supplying commercial power from the shore.

To reduce the problems arising at Agency wharves when catering to ships with a wide variety of power requirements, a program for installing standard electric voltage is under way.

The development of modern methods of generating electricity with possible application to buoys and remote land-based lights is being studied, including thermo-electric generators using propane gas and thermionic generators using nuclear power.

Several new fog alarm stations were established to facilitate navigation on both the East and West Coasts. Older stations have been fully equipped with new machinery as required, and new types of sound equipment have been installed for experimental purposes at several sites.

The St. John's, Nfld., and Dartmouth, N.S., Agencies were provided with a new hydraulic crane to facilitate the handling of buoys. Plastic buoy tests at the Prescott Depot were sufficiently encouraging to continue further experimenting during the past year. A number of fibre glass and plastic buoys have been supplied to the St. John's Agency, Nfld., for experimental use in sea water and more are being manufactured for use on the West Coast. New designs for buoys in the Northwest Territories are being prepared, and a small steel buoy filled with foam plastic has been designed for use in minor waters.

Publications

The annual list of lights and fog signals, in four volumes—Newfoundland, Atlantic, Inland and Pacific—was again published.

Commencing January 1, 1962, *Notice to Mariners*, which cover changes in marine aids to navigation and other matters of marine importance, were issued in the form of a National weekly edition, replacing the previous system of issues for the Atlantic, Inland and Pacific areas separately.

St. Lawrence Ship Channel

Maintenance and Improvement—Channel maintenance and improvement in the St. Lawrence and Saguenay rivers employed, throughout the navigation season, five survey and inspection vessels, and two maintenance units worked in the St. Lawrence Seaway.

The hydraulics section collected and correlated additional hydraulic data in connection with the long-term water level study.

Construction of the scale hydraulic model of the St. Lawrence river from Champlain Bridge to the head of Lake St. Peter began in the Ship Channel laboratory in Ville LaSalle in February. To provide space for the model, a 60' × 100' extension was added to the building.

In September, field work began in the Montreal-Sorel reach, including shoreline and river bottom contours, water levels, surface currents and flow measurements.

The 1960 two-year contract for widening at Contrecoeur-Lanoraie, and Barre a Boulard and Cap Sainte-Ste. Croix channels was completed.

A one-year contract for the Cap de la Madeleine-Becancour widening was 91 per cent completed, and a contract for deepening the Pointe a l'Ilet anchorage (Saguenay-Chicoutimi) and part of the channel downstream from the anchorage was completed.

The Montreal Harbour-Sutherland pier extension was completed. This was a National Harbours contract, of which 80 per cent of the cost was paid by the Ship Channel on the basis of its being a widening of the main channel and an approach to a wharf development. Dredged material was used as back fill.

At Cap Gribanne, in the East Narrows below Quebec, and in Cap Sainte-Ste. Croix Channel and Petite Traverse Contrecoeur, above Quebec, maintenance dredging was performed.

Dredging operations in Montreal Harbour were continued under Ship Channel supervision. Maintenance surveys and sweeping were conducted in the St. Charles River and Wolfe's Cove in Quebec Harbour, and at all the berths in Three Rivers Harbour.

Maintenance Sweeping in the St. Lawrence Seaway—On April 1, the Ship Channel took over maintenance sweeping of all non-canal reaches of the Canadian section of the St. Lawrence Seaway between Montreal and Lake Ontario, including the turning area and Seaway entrance in Montreal Harbour.

Canals

The nine canals operated by the Department are located in Nova Scotia, Quebec and Ontario. The Canso Canal has the largest lock and provides navigation for Seaway size commercial ships through the Canso Causeway.

Traffic—The Grenville and Carillon canals remained closed because of the construction of the Quebec Hydro dam, and traffic was, therefore, curtailed. The dam is scheduled to be completed by September 1, 1962.

Overall pleasure boat traffic on the other canals continued to rise, the Rideau and Trent canals in particular showing substantial increases. Lockages totalled 136,324, an increase of 14,206 over the previous year, of which 82,849 were through the Trent system and 42,320 through the Rideau.

Construction and Engineering—In the program of modernizing and rehabilitating the Trent Canal system, many maintenance and construction jobs were completed, including two new lockmaster's dwellings; two sets of lockgates; the removal of old powerhouses on two dams; and a new lighting system at one lock.

The Department contributed \$110,000 to the Ontario Department of Highways towards the cost of a new bridge at Gamebridge.

In November, a contract was awarded for a new lock at Fenelon Falls to replace the existing flight locks, and in February for the structural steel and operating equipment.

Contracts were also let for constructing three new watch-houses at two locks and at Lindsay lock station. Approximately 80 per cent of the work was completed by the end of the fiscal year.

On the Rideau Canal a 140-foot section of retaining wall near Hartwells Locks were replaced; wharves at Clowes, Smiths Falls and Narrows lock stations were rebuilt; and the old abutments, pivot-pier and rest pier of Bronson Avenue Bridge were removed from the canal bed.

The new high-level fixed bridge replacing the canal swing bridge at Kars was completed by the County of Carleton and opened to traffic in September.

Contracts were awarded for the construction of a new swing bridge at Old Slys. The bridge is scheduled for completion by August 31, 1962.

At the Canso and St. Peters canals, maintenance work carried out included overhauling and cleaning lockgates and operating machinery, and at St. Peters concrete entrance walls were repaired and a section of timber retaining wall was replaced. Canso canal roads were graded, levelled and ditched, canal lands around the lock station and superintendent's residence were filled, graded and sodded, and a parking area and roadway to the administration building were paved.

At the Carillon canal a new concrete reinforcing wall was constructed, and at Chambly construction work included new gates for one lock, a 32' x 50' extension to the workshop, and automatic heating installed in machine shops. Reconstruction of the stone retaining wall at the lock entrance of Ste. Anne canal was 75 per cent completed.

Harbours and Property

Harbour Commissions—The Oshawa Harbour Commissioners Act became effective on April 7, making a total of eleven active harbour commissions.

Public Harbours—During the year the harbours at Seven Islands, Que., and Botwood, Nfld., were proclaimed under the Canada Shipping Act. There are now 309 public harbours so proclaimed and controlled by the Department, 110 of which are in charge of harbour masters. Harbour masters are remunerated from dues collected. Total collections for the year amounted to \$232,442, an increase of \$31,105 over the previous year.

Wharves—There are over 2,500 wharves, piers and breakwaters under the administration of the Department, 493 of which are in charge of wharfingers.

Revenue from wharf properties amounted to \$1,037,423, an increase of \$49,912 over the preceding year.

Water Lots—Water-lots leases in effect totalled 194, yielding a revenue of \$42,450.

Steamship Inspection

Machinery inspection and construction regulations, consistently amended over the past eight years to meet modern developments, were under review for rewriting. They will be incorporated under a single set of regulations, and will include the 1960 Safety of Life at Sea Convention requirements for Convention ships, and the extent to which they will be applied to Canadian domestic shipping will be considered.

The operation of the expensive and complicated propulsion machinery being installed in large modern ships was reviewed, and it was considered that, for safe operation, this machinery should be under the supervision of engineers holding the highest qualifications. Legislation was passed requiring at least two engineers on ships propelled by compound steam engines or turbines having a nominal horsepower over 300 or ships of any other type of machinery having a nominal horsepower over 90.

The fire detection and extinguishing equipment regulations were completely rewritten, and the handbook of approved diesel engines and reduction gears was supplemented by the addition of 62 diesel engine models and 19 reduction gears.

Because of the number of old Great Lakes type vessels of both Canadian and United States registry being towed overseas for scrapping, special inspection and certification procedures for such vessels were developed.

Recommended standards for the control of gas hazards in ships to be repaired or altered were prepared and will be issued shortly.

Steamship inspection service is maintained at fifteen points across Canada. The office at Midland, Ont., was closed on April 30 and its operations transferred to the office at Collingwood. In September, an office was opened at Rimouski to provide better service in the lower St. Lawrence area and in the Gaspé Peninsula.

Since the introduction of the Federal shipbuilding subsidy, there has been a marked increase in the number of plans submitted to the Steamship Inspection Service and also in the number of inspections required at shipyards.

Inspections carried out included 87 new ships, 59 ships converted or reconditioned, six new ships and 21 existing ships built outside Canada and transferred to Canadian registry. In addition, 1,743 Canadian registered vessels and 52 registered or owned elsewhere, totalling 1,863,008 gross tons, were inspected. Of these, 436 were passenger ships totalling 281,139 gross tons.

Ships' tackle inspections numbered 5,355, an increase of 148 over the previous year, with 305 cases requiring repairs, adjustments or testing of cargo handling gear.

Facilities in Newfoundland—Agreement was reached with Newfoundland Shipyards Ltd. for the construction of a marine haulout facility at Clarenville, and with the Province of Newfoundland for one at Lewisporte, and work commenced in drawing up plans and specifications.

Wave Study

A study of prevailing wave conditions in the Gulf of St. Lawrence was undertaken by the Department of Mines and Technical Surveys on behalf of the Department to determine if Great Lakes type vessels can safely proceed beyond the present Inland Waters limits—the western end of Anticosti Island.

Dangerous Goods

Dangerous goods shipping regulations and their application are under constant review and new methods of packaging are continually being evaluated. Close liaison is maintained with the St. Lawrence Seaway Authority on the passage of dangerous goods through the Seaway channels and locks, and with the Armed Forces on water transport of dangerous military goods.

A technical committee on uniform regulations for the transport of radioactive materials was established, composed of representatives from government transportation and scientific bodies.

International Conference

As a result of the International Conference on the Safety of Life at Sea held in London, England, major marine regulations are being rewritten.

Lifejackets

Specifications for the Department's new standard lifejacket are now available from the National Research Council.

Small Boat Operations

A federal-provincial meeting to discuss all aspects of pleasure boating was held during the year, with representatives from all the provinces attending.

Regulations to provide for the compulsory carriage of small plaques indicating the recommended safe load and maximum horsepower in certain categories of powered pleasure boats are being considered.

A new edition of the booklet, *Safety Afloat*, was distributed, and departmental officers addressed the public at sporting clubs and youth groups on all aspects of safe pleasure boating.

Pollution Prevention

Oil—Delegates attended the Oil Pollution Conference in London, England, held under the auspices of the Inter-Governmental Maritime Consultative Organization. Changes as a result of the conference included the extension of Canada's West Coast prohibited zone from 50 miles to 100.

Violations of the Oil Pollution Prevention Regulations resulted in four convictions, and departmental and armed forces aircraft are being used increasingly for the detection of offenders.

Air—Under authority of the Canada Shipping Act and as a result of meetings with the Technical Advisory Board of the International Joint Commission, proposed regulations have been drafted for the prevention of pollution of the air by ships' smoke.

Marine Engineers

Training—Eight trainees under the Department's marine engineer training scheme were engaged in practical marine work in Canadian shipyards, a second group of five trainees were completing their third year, and three new trainees were in their first year. In the latter group there are still two vacancies.

All trainees took advanced evening class work, and were given a four-week course in June to supplement their technical studies.

Schools—Marine engineering schools, formerly controlled or assisted by the Department, are now operated by the various provincial authorities under the Technical and Vocational Training Assistance Act controlled by the Department of Labour.

Examinations—The re-organization of the examination system for certificates of competency as marine engineers was completed, the standards of the examinations throughout the country now being controlled by a centralized classification system.

Engineer examination regulations were revised and put into effect to keep abreast of modern trends in marine engineering. In addition, a new certificate—competency as chief engineer of a motor-driven fishing vessel—was introduced.

Of the 1,078 candidates for certificates of competency as marine engineers, 862 were successful and 104 obtained partial passes.

Revenue

Revenue collected, including inspection services and examination fees, totalled \$168,929.

Ship Registration

Small vessels exempt from registry and licensed under the Small Vessel Regulations numbered 54,247, making a total of 357,390 vessel licences issued throughout Canada to December 31, 1961. During the same period, 1,106 vessels were added to Canadian registry and 427 removed, making a net increase of 679 for the year. At the end of December there were 21,060 vessels of 2,630,940 gross tons registered in Canada.

Information on some 6,688 separate transactions involving first registry, re-registry, transfers and transmissions of ownership, mortgages and changes of name, together with details of all vessels registered during this period, were supplied to the Register General of Shipping and Seamen in the United Kingdom. This information is used in compiling the *Mercantile Navy List and Maritime Directory*, which gives particulars of all vessels registered in the Commonwealth.

Hudson Bay Route

The thirty-third annual report on navigation conditions on the Hudson Bay Route from the Atlantic seaboard to the Port of Churchill, covering the 1960 season of navigation, was prepared and published.

Grain Loading Arrangements and Live Stock Shipping

Grain loading arrangement plans inspected and approved by headquarters for ships expecting to load grain in Canada totalled 277, and 17,253 head of live

stock were shipped from Montreal to ports abroad on ships fitted as prescribed by the Live Stock Shipping Regulations.

Salvage Subsidies

A subsidy contract of \$75,000 with Foundation Maritime Ltd. was in effect during the 1961 navigation season. The contract required the provision and maintenance of a salvage wrecking plant complete for service in the River and Gulf of St. Lawrence.

Pilotage

There were 381 licensed pilots engaged in pilotage in the ten districts for which the Minister is the Pilotage Authority. They performed 46,073 pilotages inward or outward and 11,300 movages, grossing \$5,829,940 in fees.

Labrador—Three pilots were employed during the navigation season to assist ships into and out of Goose Bay.

Port Weller-Sarnia—Under prevailing rate regulations, 45 pilots were employed during the navigation season to conduct ships from Port Weller to Sarnia. Pilotages totalled 2,967, grossing \$627,994 in fees.

Masters, Mates and Seamen

Examinations held for masters, and first and second mates certificates of competency and service totalled 794. In addition, 86 sight test examinations were held. A total of 412 masters, 88 first mates and 78 second mates were granted certificates, and 460 renewals of temporary master certificates were issued for which no examinations were held.

Eleven seamen received certificates of qualification as ships' cooks and 59 qualified as able seamen. A total of 142 seamen were examined for certificates of efficiency as lifeboatmen, 136 of whom were successful.

A total of \$14,010 was received in examination fees.

Accounts received in connection with the relief, maintenance and repatriation of seamen left behind at ports abroad amounted to \$739. Amounts of \$1,943 and \$1,716, representing deserters wages and fines, respectively, were received and deposited in the Consolidated Revenue Fund of Canada.

During the year, there were 32,925 engagements and 33,507 discharges of seamen from ships of British registry at 101 Canadian ports.

Navigation Schools

Financial aid was given to the Vancouver navigation school operated by the local education authority. The Department also maintained a school at Prince Rupert during the winter only, chiefly for giving instruction in the operation of small boats in the area.

Marine Casualties

Two marine casualty investigations were held under the Canada Shipping Act.

Canadian Coast Guard

On January 26, the Department's fleet of 60 ships and 181 northern service landing craft was officially designated the *Canadian Coast Guard*. The latest addition to the fleet is the shallow draft buoy vessel, *Eckaloo*, commissioned on June 24, 1961, for service in the Mackenzie River. CCGS *N. B. McLean* was extensively modernized, and a general program of modernizing ship electronic equipment, in conjunction with the Telecommunications and Electronics Branch, was started.

An improved uniform system of position reporting provides the Operations Centre in Ottawa with full daily information on ships positions and future movements. Rescue co-ordination centres are included in the communications network.

Engineering

Ten engineer candidates, granted study scholarships, were successful in obtaining advancement in certification and arrangements were made to permit engineer officers to take construction, maintenance, and operational courses in diesel electric propulsion and other electrical equipment.

Standardization of lubricating oils for machinery in all ships was undertaken. By this system all fuels, lubricating oil, and grease supplies are ordered by Canadian Government Standards Board numbers only, thus avoiding the use of "brand" names and further encouraging competitive tendering.

Northern Operations

Icebreaking for merchant vessels proceeding to Churchill commenced in the Hudson Bay on July 21. The first arrival was on July 22, the earliest date that a grain vessel has arrived at that port. A total of 49 grain vessels loaded 19,351,000 bushels of grain, the last vessel clearing Churchill on October 12.

Thirty-nine ships, travelling some 300,000 miles, carried 110,000 short tons of cargo to 75 ports of call during the Department's annual Arctic re-supply operations. In addition, aids to navigation were serviced, DF stations were calibrated and medical and administrative work for the Departments of National Health and Welfare, and Northern Affairs and National Resources was carried out by the Arctic Patrol vessel, CCGS *C. D. Howe*. The Canadian Coast Guard ships also carried hydrographic and oceanographic teams.

Winter Icebreaking

The booklet, *Guidance to Merchant Ships Navigating in the Gulf of St. Lawrence*, was revised and given wide distribution before the season commenced. An ice operations room was set up on the Government Wharf at Sydney, N.S., staffed with an ice information officer, two assistants and a meteorological technician, to co-ordinate the movements of icebreakers and merchant ships in the Gulf and on the Eastern seaboard.

With a relatively mild winter, the fleet of four icebreakers experienced no unusual difficulty and carried out normal operations in the Quebec-Montreal reach of the St. Lawrence River, in the Lake St. Louis section of the Seaway, and in the Saguenay River.

The newly completed piers of the Champlain Bridge helped to stabilize the early formation of ice in Laprairie Basin and to retain the cover after it had formed, which reduced the danger of flooding in Montreal Harbour.

Great Lakes Research

CCGS *Porte Dauphine* operated in the Great Lakes during the year for the Meteorological Branch and the Great Lakes Institute, engaged on various research and scientific projects. Severe ice conditions curtailed operations during January and February.

Weatherships

Both CCGS *Stonetown* and *St. Catharines* again maintained a continuous patrol at Ocean Weather Station "P" situated some 900 miles out in the Pacific.

Ship Construction

Ten vessels were completed, 14 are under construction, and 18 are being designed. Vessels completed were: a shallow draft vessel, *Eckaloo*, for service with the Marine Agency at Fort Smith, N.W.T.; two pilot boats for Les Escoumins, P.Q.; a 34-foot workboat, *Severn*, for the Trent Canal service; a passenger and cargo vessel, *Petite Forte*, for the Canadian National Railways Newfoundland coastal service; two passenger and cargo vessels, *Federal Maple* and *Federal Palm*, for service in the West Indies Federation; a tug, *Kelligrews*, for the Department of Public Works; a ferry, *R. A. Hoey*, for the Citizenship and Immigration Department for the Christian Island service; a trapboat and long liner for the Department of Northern Affairs and National Resources for service at Grand Bank, Nfld.

Vessels under construction are: a supply and buoy vessel for the Prescott Marine Agency, and one for Sorel, P.Q.; five search and rescue patrol vessels for service in Eastern, Western and Central Canada; a depot ship *Narwhal* for service in Northern areas; a passenger and cargo vessel, *Taverner*, for the C.N.R. Newfoundland coastal service; an automobile and passenger ferry, *Confederation*, for service between Cape Tormentine, N.B., and Borden, P.E.I.; a research vessel, *G. B. Reed*, for the Fisheries Research Board; a tug boat for National Harbours Board service at Churchill; and a protection vessel and a patrol vessel for the Fisheries Department.

Vessels in the design stage are: three wood search and rescue patrol vessels for service in Central Canada; a cable repair ship and icebreaker for service on the East Coast; two weatherships to maintain station "P"; a shallow draft vessel for service on the Mackenzie River; a workboat for the Prescott Marine Agency; a workboat for service on the West Coast; a triple screw icebreaker for service in the Gulf of St. Lawrence and Northern areas; a passenger and cargo vessel for C.N.R. Newfoundland service; a bait vessel for the Fisheries Department for service in Newfoundland; and other small vessels for this and other Departments.

RAILWAY SERVICES

Canadian National Railways

The Canadian National Railways operated at a deficit of \$67,307,772 compared with a deficit of \$67,496,777 the previous year.

Trans-Canada Air Lines

Trans-Canada Air Lines operated at a deficit of \$6,450,082, for the calendar year 1961, an increase of \$3,842,732 over the previous year. The deficit was paid by the Government and absorbed into the Consolidated Deficit Account.

Prince Edward Island Ferry and Terminals

The Prince Edward Island ferry service operated at a deficit of \$2,984,552 in 1961, an increase of \$363,088 over the previous year.

The new ferry MV *Confederation* is expected to go into operation between Tormentine and Borden in May. Payments towards the cost of the ferry amounted to \$1,188,096.40 and \$208.14 was spent on the docks at Borden.

Vehicle traffic between the Island and the mainland continued to increase. In 1961 some 178,474 vehicles were handled, an increase of 7,234 over the previous year. Rail freight handled for the same period totalled 672,488 tons, a decrease of 27,334 tons.

Newfoundland Ferry Services

In addition to the regular freight and passenger service operated between North Sydney, N.S., and Port aux Basques, Nfld., a freight service only was operated throughout the year between North Sydney, N.S., and various other Newfoundland ports as required. These services operated at a deficit of \$7,270,792 compared with \$5,432,820 in 1960.

Docks and Terminals—Expenditures for additions and betterments to the terminal facilities at North Sydney amounted to \$31,779, and at Port aux Basques, \$134,300.

Yarmouth, N.S.—Bar Harbor, Me., Ferry Service

This service operated at a deficit of \$109,645 compared with \$151,224 the previous year.

Traffic handled during 1961 consisted of 88,615 passengers, 26,206 automobiles, 2,885 trucks and 513 other highway vehicles, a decrease of about 5 per cent in volume from last year.

Maritime Freight Rates

Payments under the Maritime Freight Rates Act amounted to \$12,209,476, a decrease of \$1,855,324 from the previous year.

Great Slave Lake Railway

Survey work for a proposed railway from Grimshaw, Alta., to Pine Point, Great Slave Lake, commenced by the Canadian National Railway Company in December, 1960, was completed late in 1961, at a cost of \$616,765, and the Company was authorized to proceed with the construction.

Surveys show the projected line as 430 miles in length, commencing at Roma near Grimshaw to Hay River, N.W.T., a distance of approximately 377 miles, with a branch to Pine Point Mines, a further distance of approximately 53 miles.

The estimated capital cost of the line is \$86,250,000, including a 15 per cent allowance for contingencies. The Company will be paid a subsidy by the Canadian Government equal to the cost of constructing the line, and in January, 1962, an accountable subsidy payment of \$500,000 was made.

Clearing of the right-of-way commenced in February, 1962, and construction is expected to be completed by the end of December, 1966.

FINANCIAL SUMMARY

(Comparative Summary of Expenditures and Revenues)
(for the Fiscal Years Ended March 31, 1961 and 1962)

	<i>Millions of Dollars</i>		
	<i>Increase (+)</i>		
	<i>or</i>		
	<i>Decrease (—)</i>		
	1961-62	1960-61	
<i>Administration, Operation and Maintenance Expenditures</i>			
Departmental Administration	3.5	3.1	.4 (+)
Air Services	76.5	70.5	6.0 (+)
Marine Services	36.5	35.1	1.4 (+)
Railway and Steamship Services	97.6	92.7	4.9 (+)
Miscellaneous Services	98.4	51.1	47.3 (+)
	<hr/> 312.5	<hr/> 252.5	<hr/> 60.0 (+)
<i>Capital Expenditures</i>			
Air Services	73.5	63.4	10.1 (+)
Marine Services	14.7	14.0	.7 (+)
Railway and Steamship Services	4.8	6.0	1.2 (—)
	<hr/> 93.0	<hr/> 83.4	<hr/> 9.6 (+)
TOTAL DEPARTMENTAL EXPENDITURES	<hr/> <hr/> 405.5	<hr/> <hr/> 335.9	<hr/> <hr/> 69.6 (+)
<i>Revenues</i>			
Air Services	18.1	15.7	2.4 (+)
Marine Services	5.2	8.2	3.0 (—)
Railway and Steamship Services	0.4	5.2	4.8 (—)
	<hr/> 23.7	<hr/> 29.1	<hr/> 5.4 (—)
<i>Miscellaneous Services</i>			
Interest—St. Lawrence Seaway Authority Loans	<hr/> —	<hr/> 13.1	<hr/> 13.1 (—)
TOTAL DEPARTMENTAL REVENUES	<hr/> <hr/> 23.7	<hr/> <hr/> 42.2	<hr/> <hr/> 18.5 (—)

EXPLANATION OF INCREASES AND DECREASES

Administration, Operation and Maintenance Expenditures

Departmental Administration

Greater departmental operational activity as evidenced by the additional expenditures of all services and an increase of 15 per cent in Air Services revenues necessitated higher departmental administration costs amounting to \$0.3 million over the previous year. Other general disbursements of an administrative nature were up \$0.1 million.

Air Services

The improved facilities at a number of airports have enabled the department to provide more and better services for the travelling public. Operation and maintenance costs have risen accordingly and in 1961-62 were \$1.6 million more than in 1960-61. Additional expenditures of \$0.5 and \$0.7 million were incurred for the Control of Civil Aviation and of Air Traffic respectively.

Increased services and the operation of larger communication networks contributed to an addition of \$1.1 million in the amount charged to the operation and maintenance vote for Radio Aids to Air and Marine Navigation. Expenditures for the operation of the Meteorological Branch were \$16.9 million compared with \$15.1 million in 1960-61.

Marine Services

An increase of \$0.1 million in the deficits of canals entrusted to the St. Lawrence Seaway Authority and of \$0.4 million in the operation of the St. Lawrence and Saguenay rivers ship channels accounted for the added expenditure of this division. A decline of \$0.7 million in the operation and maintenance of Aids to Navigation was offset by greater expenditures by the Marine Operations Branch.

Railway and Steamship Services

During 1961-62 expenditures on the location survey and the construction subsidy for the railway to Great Slave Lake amounted to \$1.1 million compared to \$0.1 million the previous year. The operating deficit of the Canadian National Railways was \$67.2 or \$0.3 million less than in 1960-61. The Trans-Canada Air Lines deficit was up \$3.8 to \$6.4 million and the increase of \$2.2 million in the deficits arising from the operation of ferries and their terminals was more than enough to compensate for the drop of \$1.9 million in the payments authorized by the Maritime Freight Rates Act.

Miscellaneous Services

Pending the complete report of the Royal Commission on Railway Problems, the Board of Transport Commissioners was authorized to approve interim payments of an aggregate amount of \$50.0 million in respect of the calendar year 1961 to

companies as defined in the Freight Rates Reduction Act as compensation to such companies for maintenance of their rates on freight traffic at reduced levels. Capital subsidies for the construction of commercial and fishing vessels amounting to \$2.0 million were paid for the first time during 1961-62. The special contribution to the Railway Grade Crossing Fund was reduced in 1961-62 from \$10.0 to \$5.0 million and a decrease in the statutory contribution re Freight Rate Reduction of \$1.4 million was almost balanced by an increase of \$1.2 million in steamship subventions for coastal services.

Capital Expenditures

Air Services

Expenditures on airport improvements and air terminal construction increased by \$4.7 million over 1960-61. Prompt delivery of telecommunication equipment permitted the service to utilize almost all the funds provided for the construction and acquisition of Radio Aids to Air and Marine Navigation and together with an expanded program resulted in additional expenditures of \$5.5 million. There were small decreases in other capital disbursements by Air Services during 1961-62.

Marine Services

The construction and acquisition of Aids to Navigation and the dredging of the St. Lawrence river ship channel required additional funds amounting to \$3.1 million. There was a reduction of \$1.4 million in the cost of construction and acquisition of ships and equipment by the Canadian Coast Guard (formerly Canadian Marine Service). There was no payment to correspond to the \$930 thousand paid during 1960-61 to the Canada Starch Company Limited as compensation for cancellation of a lease in respect to certain lands affected by the St. Lawrence Seaway and Power Development.

Railway and Steamship Services

There were reductions in the disbursements on various construction programs totalling \$1.2 million.

Revenues

Air Services

The operation of airports and other ground services showed additional revenue of \$3.3 million due to higher returns from aircraft landing fees, rentals and concessions. The new terminal buildings at Halifax, Montreal and Ottawa were in operation for a full fiscal year for the first time during 1961-62. There were small reductions in the revenue received from some of the other areas of Air Services' operations.

Marine Services

Although there appears to have been a drop in the revenue collected by Marine Services, it must be pointed out that the 1960-61 figures were augmented

by receipt during that year of \$3.9 million applicable to supply support of Dew Line stations for the year 1959.

Railway and Steamship Services

The 1960-61 receipts reflected a payment of \$4.9 million by the Province of Nova Scotia as its share of the cost to date of the Canso Causeway. As this was a non-recurring item, ordinary revenue remained at approximately the same level as in the previous year.

Miscellaneous Services

The interest due during 1961-62 on the loans to the St. Lawrence Seaway Authority was deferred.

DEPARTMENT OF TRANSPORT

AIR SERVICES

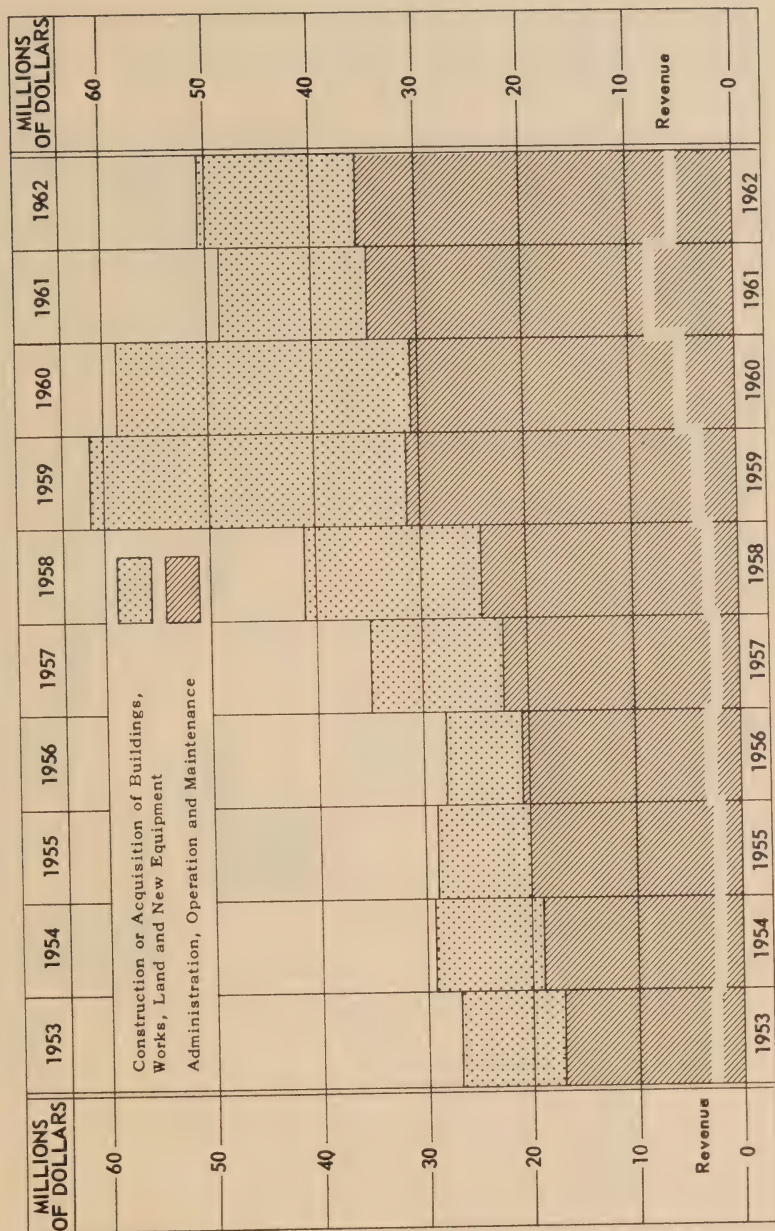
EXPENDITURES AND REVENUES FOR THE FISCAL YEARS 1952-53 TO 1961-62 INCLUSIVE

MILLIONS OF DOLLARS	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962	MILLIONS OF DOLLARS
— 150.0											150.0
— 137.5											137.5
— 125.0											125.0
— 112.5											112.5
— 100.0											100.0
— 87.5											87.5
— 75.0											75.0
— 62.5											62.5
— 50.0											50.0
— 37.5											37.5
— 25.0											25.0
— 12.5											Revenue
Revenue											12.5
— 0											0

Construction or acquisition of buildings
works, land and new equipment

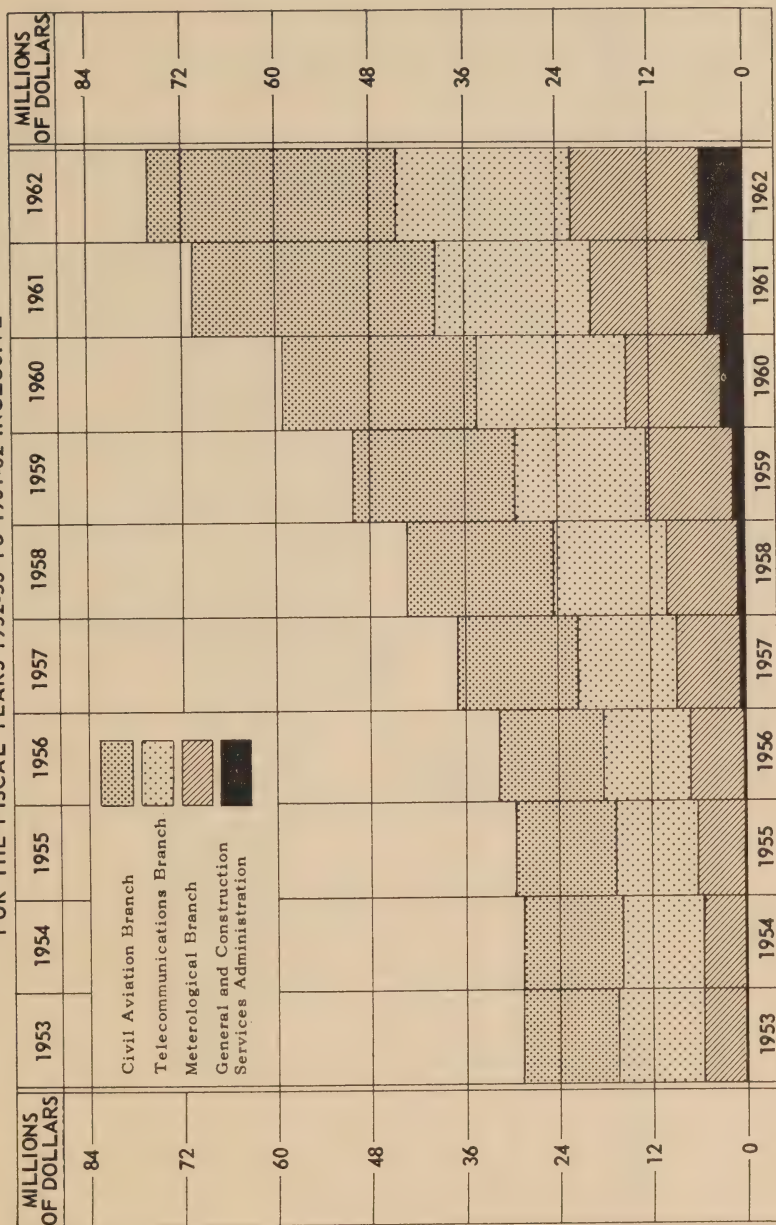
Administration, operation and maintenance

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MARINE SERVICES EXPENDITURES AND REVENUES
FOR THE FISCAL YEARS 1952-53 TO 1961-62 INCLUSIVE

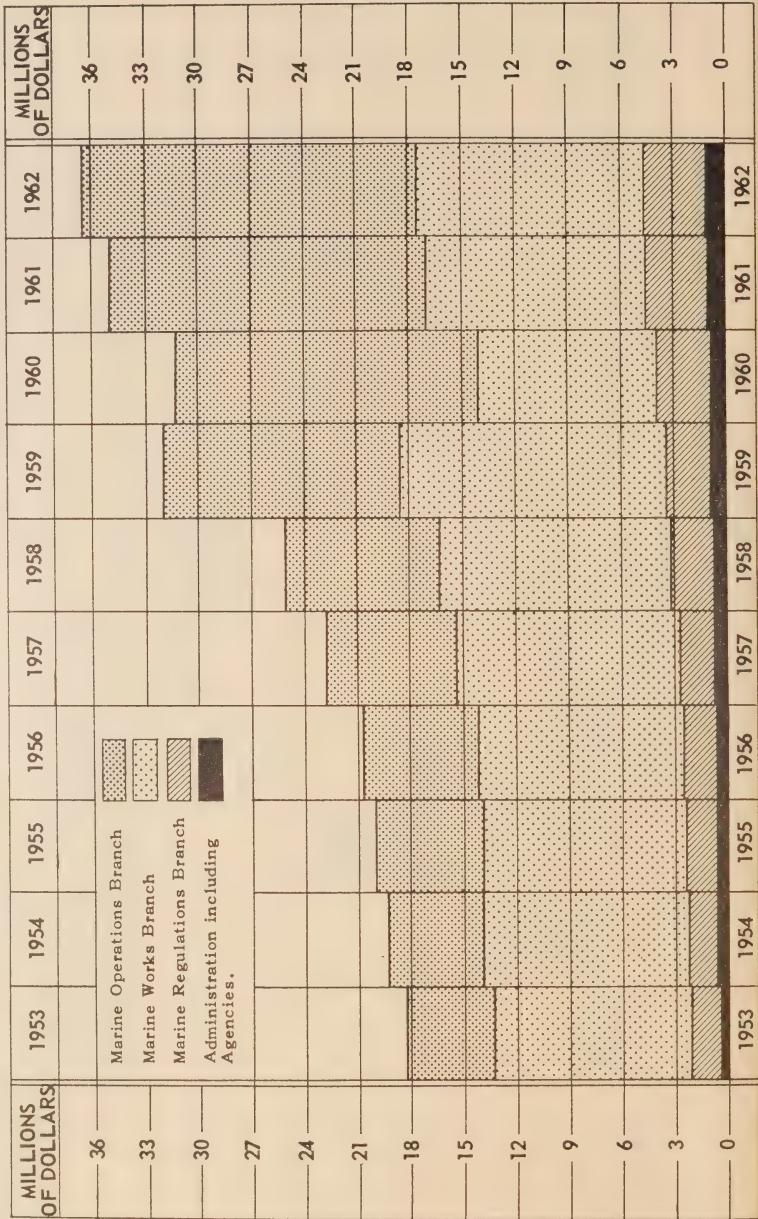


FAIR SERVICES - ADMINISTRATION OPERATION AND MAINTENANCE EXPENDITURES

FOR THE FISCAL YEARS 1952-53 TO 1961-62 INCLUSIVE



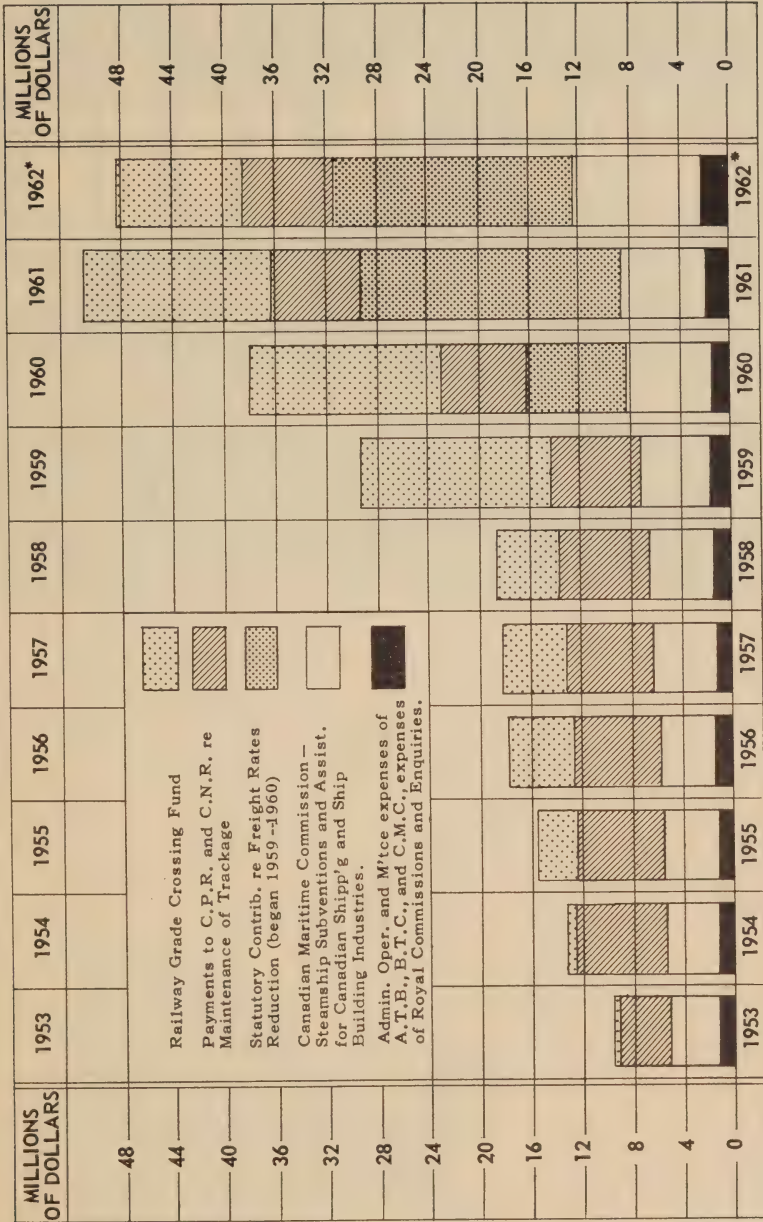
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MARINE SERVICES - ADMINISTRATION OPERATION AND MAINTENANCE EXPENDITURES
FOR THE FISCAL YEARS 1952-53 TO 1961-62 INCLUSIVE



DEPARTMENT OF TRANSPORT

MISCELLANEOUS SERVICES - EXPENDITURES

FOR THE FISCAL YEARS 1952-53 TO 1961-62 INCLUSIVE



* Does not include \$50 million interim payments for freight rate maintenance pending complete report of Royal Commission on Railway Problems.

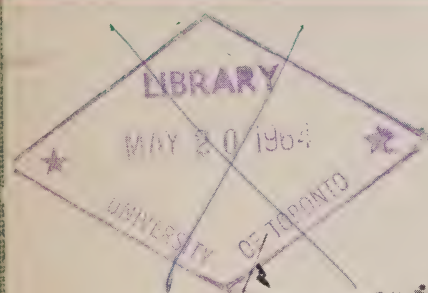
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annual report

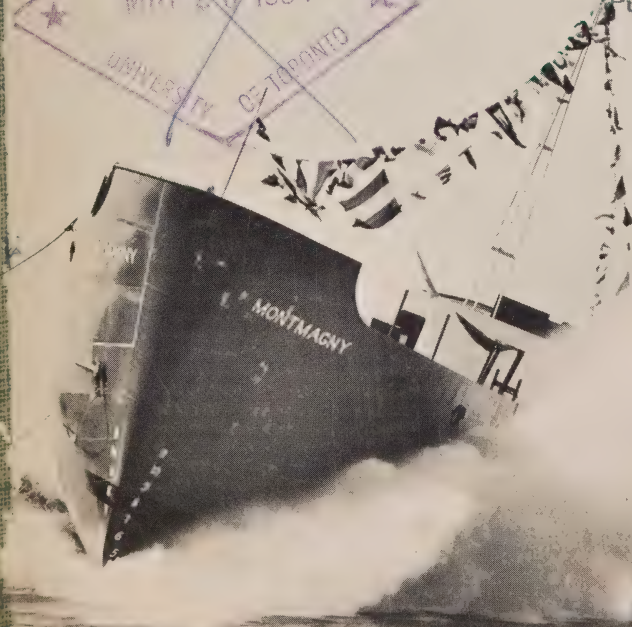
FOR THE FISCAL YEAR ENDED MARCH 31, 1963

DEPARTMENT OF TRANSPORT

ottawa, canada



Government
Publications



ANNUAL REPORT
Department of Transport

COVER—Launching CCGS *Montmagny* at Owen Sound, Ont.



CANADA

DEPARTMENT OF TRANSPORT

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ANNUAL REPORT

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FOR THE FISCAL YEAR ENDED

MARCH 31

1963

Submitted Under the Provisions of the
DEPARTMENT OF TRANSPORT ACT

ROGER DUHAMEL, F.R.S.C.
QUEEN'S PRINTER AND CONTROLLER OF STATIONERY
OTTAWA, 1964

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ROGER DUHAMEL, F.R.S.C.

Queen's Printer and Controller of Stationery

Ottawa, Canada

1964



*To His Excellency Major-General Georges P. Vanier, D.S.O., M.C., C.D.
Governor General and Commander-in-Chief of Canada*

MAY IT PLEASE YOUR EXCELLENCY:

The undersigned has the honour to present to Your Excellency the Annual Report of the Department of Transport for the fiscal year ended March 31, 1963.

GEORGE J. McILRAITH, Q.C.,
Minister of Transport.

MINISTRY OF TRANSPORT

MINISTER

BOARDS, COMMISSIONS AND GOVERNMENT-OWNED COMPANIES

Air Transport Board
Board of Transport Commissioners
Canadian Maritime Commission
Canadian National Railway Company
Canadian Overseas Telecommunication Corporation
National Harbours Board
St. Lawrence Seaway Authority
Steamship Inspection Board
Trans-Canada Air Lines

ACTS ADMINISTERED BY THE DEPARTMENT OF TRANSPORT

GENERAL

Bills of Lading Act
Canadian Overseas Telecommunication Corporation Act
Department of Transport Act
St. Lawrence Seaway Authority
Telegraph Act
Transport Act

AIR SERVICES

Aeronautics Act
Carriage of Goods by Air Act
Foreign Aircraft Third Party Damage
Radio Act
Trans-Canada Air Lines Act

MARINE

Belleville Harbour Commissioners Act
Canada Shipping Act
Canadian Maritime Commission Act
Canadian National Steamships Act
Government Harbours and Piers Act
Government Property Traffic Act
Government Vessels Discipline Act
Hamilton Harbour Commissioners Act
Lakehead Harbour Commissioners Act
Live Stock Shipping Act
Nanaimo Harbour Commissioners Act

National Harbours Board Act
Navigable Waters' Protection Act
New Westminster Harbour Commissioners Act
North Fraser Harbour Commissioners Act
Oshawa Harbour Commissioners Act
Port Alberni Harbour Commissioners Act
Toronto Harbour Commissioners Act
Water Carriage of Goods Act
Windsor Harbour Commissioners Act
Winnipeg and St. Boniface Harbour Commissioners Act

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Canadian National-Canadian Pacific Act
Canadian National Railways Financing and Guarantee Act
Canadian National Montreal Terminals Act
Canadian National Railways Pensions Act
Canadian National Toronto Terminals Act
Government Railways Act
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Maritime Freight Rates Act
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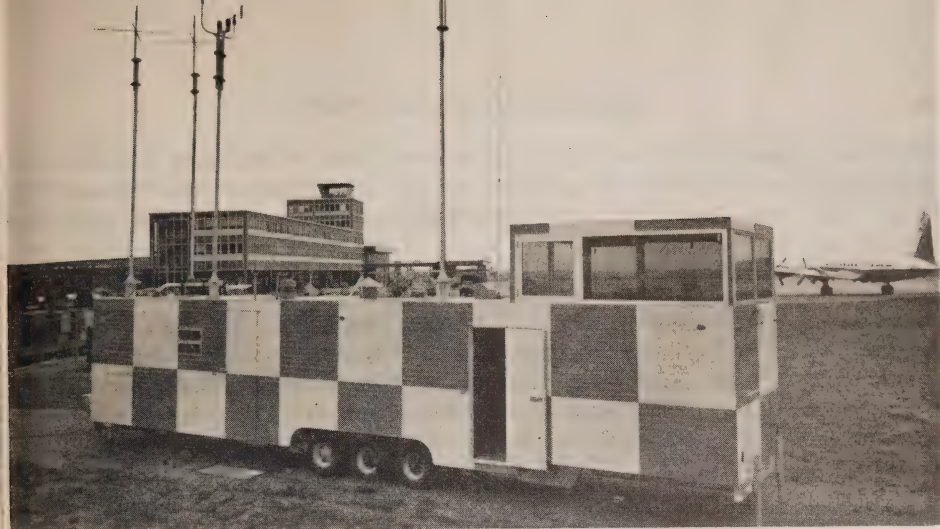
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The Department's mobile air traffic control tower

AIR SERVICES

Airports

Development—Projects to raise the standard of airports to handle the larger jet aircraft and increased traffic density progressed steadily and included the construction of additional runways, runway lengthening and strengthening, taxiways, parking aprons and access roads.

Work was undertaken, continued or completed at Fredericton, Moncton and Saint John, N.B.; Quebec, Charlevoix, Montreal and Roberval, Que.; London, Toronto, Toronto Island, Ottawa, North Bay, Sault Ste. Marie, and Red Lake, Ont.; Winnipeg, Winnipeg satellite, and Lynn Lake, Man.; Regina and Saskatoon, Sask.; Calgary and Edmonton, Alta.; Kamloops, Pitt Meadows, Vancouver and Victoria, B.C.; and Norman Wells, N.W.T.

Treasury Board approval in principle was received for improvements and/or expansion of airports at Deer Lake, Nfld.; Yarmouth, N.S.; Saint John, N.B.; Seven Islands, Que.; Lakehead, Ont.; Thompson and Churchill, Man.; Medicine Hat, Alta.; Port Hardy, Prince George, Abbotsford, Terrace, and Fort Nelson, B.C.; and Whitehorse and Watson Lake, Y.T.

Surveys were carried out for the development of Air Services facilities at a number of sites, including Saint John, Fredericton, Lakehead, North Bay, Thompson, Calgary, Fort Nelson, Terrace, Whitehorse and Watson Lake.

Major landscaping contracts were completed at Halifax, Montreal and Ottawa, and lesser developments were carried out at Quebec, Williams Lake, Penticton, Prince Rupert and Port Hardy. Plans were completed for landscaping at Toronto and North Bay, and under way for Winnipeg, Edmonton and Victoria.

Capital Assistance—Cost-sharing grants for local airports totalling \$87,600 were made to the village of Campbell River and the city of Dawson Creek, B.C., for the further development of their municipal airports, and to the County of Restigouche, N.B., for a new airport.

Twenty applications for assistance were received, 15 for local airports on a cost-sharing basis and five for grants-in-aid for remote airport development. Of these none were approved in principle, primarily because the sites were not suitable, the economic need was insufficient, or the local interests did not accept the obligations to be met where assistance might otherwise have been warranted.

Operating Subsidies—Operating subsidies were paid for the airports at Trenton, N.S.; Saint John, N.B.; Forreestville and Riviere du Loup, Que.; Brandon and Dauphin, Man.; Beaverlodge and Prince Albert, Sask.; Medicine Hat and Peace River, Alta.; and Campbell River and Kelowna, B.C.

Equipment and Maintenance—During the year, 154 pieces of major airport maintenance equipment were purchased to replace worn out or obsolete types and to provide for expanded airport facilities.

Snowfall across the Prairie region was very light during most of the winter. However, late spring snowfalls helped control the withdrawal of frost from the ground and only minor pavement damage occurred.

In the Maritime Provinces where record snowfalls occurred, the Department's airports remained serviceable throughout severe storm periods when other types of transportation were disrupted.

Sand bonding continues to be the principal method of combatting the ice hazard on runways. Several chemical ice-melting products have been analyzed in an attempt to find a non-corrosive material with no success. A specification for runway sand was drawn up and all purchases must now meet this gradation standard.

High speed technique of snow removal has continued to expand, with emphasis on high speed snow drags and placing in service several 25-27,000 No. GVW conventional type dump trucks, optionally equipped to provide high-speed plowing capabilities.

A Sicard high-speed rotary snow blower was moved to Winnipeg International Airport to evaluate the machine under Prairie winter conditions.

Results of a study carried out of the cost for steam or hot water radiant heated roadways compared with snow removal using conventional equipment showed that thermal melting pits or radiant heated road beds are not yet economically feasible.

In co-operation with the Department of Agriculture, research and testing continued in the control of weeds through the use of herbicides. Additional test plots are planned for the coming year, the program being co-ordinated through the National Weed Control Committee.

Airfield maintenance was reduced at 40 airports and a number of airports of local interest only were either closed or leased to public bodies.

Because of the increasing seriousness of bird hazards to aircraft safety, an Associate Committee of the National Research Council was formed in February to study means of solving this problem in Canada.

Noise Abatement—Aircraft noise continues to be a significant problem in the operation of jet aircraft and the Department as operator of most of the major airports is endeavouring to safeguard the interests of both the airport neighbours and the commercial jet operators. At Montreal, prohibition of jet aircraft operations between midnight and 7 a.m. continues. Arrival and departure procedures

for Montreal and Toronto are being revised to make the fullest use of existing facilities and airline experience. Noise monitoring continues and individual attention is being given to airline operations that exceed reasonable noise levels.

Major Terminals—Unrest in the labour market seriously affected construction progress during the fall and winter, but by spring the situation was much improved and better progress is indicated for the coming construction season.

At Toronto, construction of the terminal complex progressed well in some areas, and the power plant contract is almost completed. Work on the site services contract, including the car parking area, roads, water mains and bridges proceeded well, and progress was good on contracts for an administration building and a control tower.

At Winnipeg, satisfactory progress is being made with the construction of the terminal, and completion is expected during the next fiscal year.

At Vancouver, pre-loading of the terminal areas to improve foundation conditions for the terminal and apron complex was started in the fall of 1962 and was almost completed by the close of the fiscal year. Plans for the basic scheme have been approved by the airlines, but a few details still remain to be resolved before the consultants can commence the final working drawings. Tenders are expected to be called in the late summer of 1964.

At Edmonton, a major contract for a terminal services building, including a heating plant, a power plant and air conditioning, was completed early in the fiscal year. Work on the terminal complex is progressing well and the general building contract is expected to be completed in the fall of 1963.

Standard Terminals and General Buildings—Contracts were awarded for terminal buildings at Fort McMurray, Penticton, and Victoria, and substantial progress was made on the new terminal under construction at North Bay. Working drawings were completed for terminals at Sault Ste. Marie, Kamloops and Yellowknife, and plans and specifications were well advanced for new terminals at London, Ont., and Fredericton, N.B. Preliminary sketch plans were prepared for extending the terminal at Fort Smith, and space requirements for an addition and extension to the Moncton terminal building were under study.

Major projects completed included a firehall, incinerator, and a standby power plant at Gander; an aircraft hangar and a surveillance radar building at Ottawa; a terminal services building, remote receiver building and one remote transmitter building at Edmonton; two maintenance garages and relocation of two dwellings at Fort McMurray; an emergency power house at Abbotsford; a maintenance garage at Yellowknife and at Norman Wells; and a rawinsonde building, hydrogen generator and storage buildings at Whitehorse.

Various radio buildings were completed at a number of sites including Port aux Basques; Antigonish, N.S.; Montague, P.E.I.; Moncton; Seven Islands, Natashquan, Port Menier and Grindstone, Que.; Sault Ste. Marie; and Prince George and Enderby, B.C. At sixteen sites other buildings projects were either completed or under way.

Northern Operations—The development of an earth-top airstrip to an approximate length of 4,800 feet at Sachs Harbour, Banks Island, N.W.T., continued during the summer of 1962. Improvements were made to the water supply for fire fighting at Cambridge Bay, N.W.T., and to the Department's section of

the utilities system at Norman Wells. Four 13,000-gallon fuel tanks were installed at Baker Lake, bringing the total capacity to approximately 150,000 gallons.

Fire Losses—Fire losses totalling \$539,234, the fourth highest in fifteen years, included four major fires—Watson Lake, \$145,000; Kapuskasing, \$230,000; Seven Islands, \$42,000; and Cape Harrison, \$70,000.

Lighting and Power—Facilities for visual aids to aircraft were in various stages of completion at 31 sites, and work on the installation of other facilities such as road and car-park lighting was carried out at Halifax, Cartierville, Windsor and Winnipeg.

The design, development and evaluation of a flush runway light, taxiway shields and sign lighting, rotating beacons, wind socks and unit substations was carried out and progress was made on the design and development of indoor regulator equipment.

Work in connection with the establishment of power facilities was carried out at 26 sites, and some 100 diesel-electric generating units ranging in size from 2.5 to 500 kw were provided for use at various sites.

Other Projects—Projects under study included providing moving sidewalks for Montreal, and the development of a standard design for apron flood-lighting installation.

Water sources were developed at Cartwright, Nfld., Kenora, Sault Ste. Marie, Cape St. James (B.C.), and Yellowknife. Domestic water supply systems, with associated sewage treatment and disposal facilities with local drainage, were provided at 10 sites, and changes and improvements were made to existing systems at four other sites.

Airport Licences—During the year, 142 airport licences were issued. The total number in force at the end of March was 597, compared with 546 the previous year.

Revenue—Total revenue from airport operations totalled \$15,617,748 as compared with \$14,677,864 the previous year. Increased passenger traffic at the majority of airports and the acquisition of the Vancouver International airport were factors in the increase.

Air Traffic Control

Aircraft movements controlled by the Department's 31 airport traffic control towers totalled 2,216,135, a decrease of 192,837 from the previous year. This decline is attributed to an increase in the number of faster and larger capacity air carriers, commercial and military aircraft, and the transfer of smaller civil aircraft operations from major to less busy uncontrolled airports.

The eight area control centres handled 694,572 IFR (Instrument Flight Rules) flight plans, and 209,596 VFR (Visual Flight Rules) flight plans.

Plans are being developed to extend area control service into Northern Canada up to 72 North latitude from flight level 250 to 450. Responsibility for this area will be divided among the Edmonton, Winnipeg and Goose area control centres.

The Airspace Reservation Co-ordination Office (ARCO), located in the Ottawa Airport terminal building, commenced operation July 16, 1962. Airspace reservation service provides reserved airspace for specified air operations in

controlled airspace and military activity areas in controlled and uncontrolled airspace.

Aircraft Licences

Civil aircraft registered at the end of the fiscal year showed an increase of 355. Of the 6,270 registered, 1,978 were commercial, 4,109 were private, and 183 were State, compared with 1,995, 3,739 and 181 respectively the previous year.

Airmen Licences

At the end of the fiscal year there were 23,238 airmen licences in force, classified as follows: pilots—glider, 588, private, 15,667, commercial, 2,180, senior commercial, 349, and airline transport, 1,325; air navigators, 84; air traffic controllers, 820; flight engineers, 25; and aircraft maintenance engineers, 2,200.

Although the number of new licences decreased by about 5.1 per cent, the number of licences remaining in force increased by 1,932 or about nine per cent.

Aircraft Accidents

During the calendar year 1962, there were 281 aircraft accidents, excluding minor ones, with 104 fatalities, compared with 319 accidents involving 75 fatalities the previous year. In 1962 there were two accidents on scheduled services—one international, the first since 1957, and the other domestic, the first since 1958, in which there were 27 and two fatalities respectively.

Air Regulations

Infractions of the *Air Regulations* resulted in 69 prosecutions as compared with 86 the previous year.

Air Carriers

At March 31, there were 673 commercial air carriers operating the various types of commercial air services in Canada, of which 411 were Canadian and 262 were foreign and Commonwealth.

Flight Operations

During the year, one Bell helicopter was added to the Department's fleet of aircraft, making a total of twenty. These are used for training and for service on board Canadian Coast Guard vessels.

Two helicopters are operated by the Department on behalf of the Department of Mines and Technical Surveys, and are based on the Hydrographic Survey Ship, *Baffin*, operating along the Maritime Coast and in the Eastern Arctic during the summer.

Aeronautical Engineering

Six aircraft type approvals were issued during the year, and six were revised to cover changes in the aircraft configuration. Work continued in connection with

the certification of one rotary wing and one fixed wing type aircraft. Twelve supplemental type approvals were issued and four were revised, all covering design changes to existing aircraft types.

Technical supervision over all civil operators and manufacturers continued, aircraft inspections increasing by nine per cent to a total of 4,602. Visits made to manufacturers, repair and overhaul organizations and other operators increased by eight per cent to a total of 1,386.

Air engineer examinations decreased by 17 per cent and totalled 604, compared with 724 the previous year.

Liaison was maintained with Air Industries Association of Canada, Air Transport Association of Canada, Royal Canadian Flying Clubs Association, Canadian Owners and Pilots Association, Canadian Aeronautical Institute, and Ultra Light Aircraft Association. Close contact continued with both the British and the United States airworthiness authorities.

Work on revising homebuilt aircraft requirements was completed and new regulations were issued.

Six company approvals were granted, several were revised, and the total number of approved companies is now 49.

Radio and Television

Radio station licences issued during the year totalled 98,485, an increase of 19,156 over the previous year. This includes stations operated by federal, provincial and municipal government departments, stations on ships and aircraft registered in Canada, as well as mobile stations operating in the public and private land mobile service, but does not include private commercial broadcasting licences.

General Radio Service licences were issued for the first time during 1962-63 and totalled 13,579.

Broadcasting—Applications for new amplitude modulated sound private commercial broadcasting station licences totalled 52, and there were 10 for new FM sound. There were 198 applications from existing private commercial broadcasting sound stations, 73 of which were for changes in facilities including nine for frequency modulated stations and 125 for transfers of stock, change in ownership or change in name of licensee.

Sixty applications were received for new private commercial broadcasting station (television) licences, and 21 for changes in facilities of established private commercial broadcasting stations (television).

During the year, 67 private commercial broadcasting stations (sound and television) commenced operation, and 39 applications for unattended operation of broadcasting stations using supervisory control systems were received and approved. Eight multiplex FM stereophonic broadcasting systems have come into operation and other FM stations are now including this system in their plan.

Information provided for the use of the Board of Broadcast Governors consisted of coverage maps, population statistics and technical information for new private commercial broadcasting station licences and applications for changes of the facilities of existing stations.

Equipment and Frequency Spectrum Standards

Changes in some radio standards specifications resulted in the largest number of radio equipments being approved in any one year since the start of the type-approval program. Totalling 1,300, this was an increase of 30 per cent over the previous year. Type-approval testing for fee at the Radio Regulations Engineering laboratory started during the year and, of the 125 radio equipments tested, 19 were for fee. Twenty-four special engineering projects were conducted, including development methods of measurement for radar and television noise levels, the evaluation of draft radio standards specifications, and investigation of special interference problems in the mobile services and signal levels in commercial television.

The Systems Engineering group evaluated the technical suitability and frequency utilization of 210 engineering submissions pertaining to the establishment of communications systems. This reflected increasing requirements in Canada for the use of VHF, UHF and SHF radio bands to convey toll telephone, network television, data, broadcasting relay and remote control information. Extensive technical studies and co-ordination with adjacent systems were carried out to permit the early site clearances for a second transcontinental microwave system.

The *Space Systems Group* undertook an extensive study of various international satellite systems proposals and is developing Canadian proposals concerning satellite communications for the 1963 Extraordinary Administrative Radio Conference to be held in Geneva.

Radio Interference Service

The results of a survey of television sweep oscillator noise and its effects on standard broadcast reception were analyzed and a proposal for a noise limits order for TV receivers was prepared.

A new survey and study has been commenced on the apparent increase of loudness in commercials on both TV and radio programs. This problem is not only of concern in Canada, but is also being investigated by other countries. Apparent loudness is affected by such factors as compression techniques, choice of announcer, and rate of delivery. These methods are under study and an indicating device for field use is being designed.

Under the provisions of the *Radio Act*, certain low power radio transmitting equipment is exempt from licensing requirements. During the year apparatus for paging, guided tours, simultaneous translations, burglar alarms and wireless microphones were examined and exempted when meeting the technical requirements.

Safety Radio Surveys, Inspections and Suppression of Interference

Radio Regulations Inspectors operating from thirty field offices throughout Canada conducted 1,438 surveys and 1,208 inspections of radio stations of various classes to ensure compliance with Canadian laws and international conventions and treaties.

Interference complaints received totalled 29,181, and complaints completed totalled 29,526.

Close liaison was maintained with manufacturers and distributors of aviation and marine radio equipment and also with organizations engaged in the use, installation, repair and overhaul of such equipment, to promote effective applica-

tion of acceptable practices in keeping with specifications and standards set by the Department.

Examinations and Certificates of Proficiency in Radio

During the year, 7,269 radio operator examinations were conducted, compared with 8,162 the previous year, and 7,679 certificates of proficiency were issued compared with 8,239.

Radio Aids to Navigation

Marine Communications—Shore Stations—During the year marine communications projects completed included transmitter and receiver sites at Corner Brook, Halifax and Prince Rupert; receiver sites at Mont Joli and Quebec; transmitter sites at Yarmouth, Charlottetown, Lakehead and Comox; and a transmitter site and operations/receiver site at Canso, N.S. Marine communications were improved at Frobisher Bay and provided at Gore Bay, Ont. Similar work is under construction at St. John's and Cartwright, Nfld.; Halifax, Mont Joli, Montreal, Kingston, Sault Ste. Marie, Sarnia, Vancouver and Bull Harbour (B.C.).

Low Frequency Aids—Combined aeronautical/marine radio beacons were established at Cape Hopes Advance, Que., Resolution Island (Cape Warwick), N.W.T., and at Lawn Point, B.C. A marine radio beacon was installed at Nottingham Island, N.W.T., and a transponder type beacon at the former marine station site on Resolution Island.

Aeronautical radio beacons were commissioned at Chute des Passes, Forestville, Charlevoix, Rouyn, Sherbrooke and Great Whale River, Que.; Red Lake, Ont.; Flin Flon, Balmoral, and Clear Lake, Man.; Fort Vermilion, Alta.; Prince Rupert and Cultus Lake, B.C.; and Cambridge Bay, Fort Resolution, Fort Smith, and Mayo, N.W.T.

Late in the year work began on establishing the Cabot Strait Decca Chain.

The marine radiotelephone station at Halifax was closed and the services provided by this station were taken over by Halifax Marine Radio.

Facsimile ice broadcasts were made by Cambridge Bay, Resolute and Frobisher during the shipping season.

Air Navigation—During the year, 20 new NDB's (non-directional beacons), two VOR's (Very High Frequency Omni Range), six Instrument Landing Systems (ILS) and one Precision Approach Radar (PAR) were put into operation, and two LF radio ranges were taken out of service. At the end of the fiscal year, the following electronic aids to air navigation were in operation: NDB's of all types, 263; VOR's, 36; ILS, 39; PAR, 3 (Gander, Montreal, and Toronto); airport and airways surveillance radars, 15; and radio ranges, 77.

Fixed Aeronautical Communications—The Gander long range VHF aeronautical communications system located at Torbay, Nfld., for the extension of the Gander ACC coverage area over the North Atlantic was 80 per cent completed.

Direct control to pilot VHF communication circuits were established at Lakehead (Winnipeg) and St. Thomas (Toronto).

Buildings, antennas and masts at the remote receiver and transmitter sites for the Edmonton International airport were completed and equipment installation was 50 per cent completed.

A mobile air traffic control tower housed in a 40-foot trailer was delivered to Ottawa in December and installation of the control system of the electronic equipment was 70 per cent completed.

A radioteletype circuit was established from Norman Wells to Inuvik and an LF circuit between Knob Lake and Nitchequon.

VOR/TACAN—Two VOR stations—at Sherbrooke, Que., and Aylmer, Ont.—were commissioned. At a number of other sites now under construction, technical difficulties have involved much more engineering time. VOR's completed at Port Hardy and Sandspit could not be commissioned because of terrain interference problems and doppler VOR is to be installed.

VOR airways across the mountains is well under way, with Enderby nearly completed and Princeton and Kimberley construction plans almost ready.

Production of 26 new VOR systems was completed, and the design of the VOR omnitest transmitters is almost completed, with production expected to begin early in the next fiscal year.

Extensions to VOR buildings at most of the 22 locations to accommodate TACAN have been completed. Three-phase power lines in each case have been brought to the site and the control circuits for the TACAN will be integrated with the VOR.

Instrument Landing Systems—At Sept Iles, Que., a complete new Instrument Landing System (ILS) was commissioned, and at Moncton, Fort St. John, Prince Rupert and Abbotsford, new systems without glide path were commissioned.

At Calgary, localizer R-28 was commissioned, and glide paths were relocated at Toronto, Winnipeg, Edmonton, Vancouver and Victoria.

A new type antenna (Yagi) was installed and placed in service at Victoria localizer.

Radar—The surveillance radar type AASR-1 at Montreal International Airport was relocated and new equipment was installed. At London, Ont., the radar buildings were completed and will be installed with the equipment from the Montreal former site.

The Precision Approach Radar (PAR) at Montreal was evaluated and modifications were made to improve its performance. Site selection and planning were completed for the installation of seven additional systems—at Halifax, Toronto, Carp training school (Ont.), Winnipeg, Calgary, Edmonton and Vancouver.

At Montreal, secondary surveillance equipment was temporarily installed and contracts were let for the supply of 16 systems for installation at major airports across Canada.

A radar-to-television scan conversion system was installed for the Montreal International Airport control tower, and seven more were ordered for installation in ATC Centres at Gander, Moncton, Montreal, Toronto, Winnipeg, Edmonton and Vancouver.

At Moncton a closed circuit television system was installed in the ATC Centre for displaying meteorological data received on teletype, and a harbour surveillance radar was installed at Camperdown, N.S.

At Ottawa and London, Ont., the installation of Decca MR-75 radars for weather surveillance was completed, and installation at Quebec is expected to be completed next year.

Maintenance and Operations

As a result of continued review of existing radio navigational aids, the two low frequency radio ranges at Megantic and Neepawa were decommissioned and the staff transferred to Sherbrooke and Dauphin where new aeradio stations were commissioned.

The air-ground communications facilities at Carmi were decommissioned and voice facilities on the Carmi low frequency radio range are being remotely controlled from Penticton aeradio station.

Embarras aeradio station and associated NDB were decommissioned and the staff transferred to Fort Chipewyan where additional air-ground communications frequencies were installed and the station up-graded to full time operation.

With the extension of commercial wire line company facilities in the North, the aeradio stations at Fort Chipewyan, Fort Smith, Fort Resolution, Hay River and Yellowknife were connected to the air-operational teletype network.

The teletype relay centre at Gander assumed relay responsibility for air-operational message traffic handled between New York and London.

The marine radio beacon at West Point, Anticosti, was decommissioned and Port Menier aviation beacon was changed to a combined aviation and marine radio beacon. The marine direction finding stations at Resolution Island, Cape Hopes Advance and Nottingham Island were decommissioned.

Cape Lazo marine radio station was decommissioned and combined with Comox aeradio station as a marine/aeradio station.

Marine radio stations at Prince Rupert and Port Arthur were relocated and combined with aeradio stations at Prince Rupert and Lakehead.

Marine facilities were established at Gore Bay aeradio station to provide shipping with radiotelephone ship-shore service during the summer months.

Landlines

With the establishment of a new trans-Atlantic submarine cable ICECAN, existing AIROPS radioteletype circuitry was replaced by leased wireline services.

Air traffic control interphone service was established between Edmonton and Yellowknife and via the ICECAN cable to Greenland and Iceland.

Telewriter service installations were provided at three locations and connections to the telex network were provided to four stations in the Great Lakes area during 1962 on a test basis.

Major projects involved the extension of the weatherfax and weather teleprinter networks to Yellowknife, and providing leased network services in the Newfoundland area.

Approximately 400 applications for additions or revisions to leased private line services and about 200 applications for additions or revisions in public telephone services were processed. The latter included provision of Centrex service at one location as well as Direct-in-Dial switchboards at two other locations.

Message Centre

Tel-tex service was made available on January 1, and a total of 79,771 messages were handled via commercial telegraph, telex and tel-tex, and by departmental teleprinter networks.

Government Telegraph and Telephone Service

The last of the line facilities of the Government Telegraph and Telephone Services, comprising 3.3 miles of submarine cable in the Tusket Island area of Nova Scotia, was sold to the Maritime Telegraph and Telephone Company. Major repairs were made to the power plant of the Pictou Island radio link and early disposal of this remaining part of the system is expected.

Emergency Measures

Plans to decentralize the Emergency National Telecommunications Organization were completed and a Regional Emergency Telecommunications Committee (RETC) was set up in each of the ten provinces, with the Regional Controller of Telecommunications and Electronics, or his representative, being named as chairman of each committee.

Meetings of the Regional Committees were held in all provinces and work was commenced on plans developed or approved by Headquarters and on problems of a local nature.

During the year, Branch emergency planning officers took part in FALLEX, a NATO civil emergency exercise, and several employees attended orientation and essential staff duties courses under the sponsorship of the Emergency Measures Organization.

Meteorological Services

Forecast information is disseminated principally through the 27 civil forecast offices situated at strategic locations across Canada. Weather forecasts for the following two days were issued four times daily for all populated regions, and marine weather forecasts were issued regularly for Canadian coastal waters and inland waterways. These general forecasts were supplemented by specially prepared forecast advice, frequently on a seasonal basis, to agriculture, forestry, industry and government interests.

Warnings were issued when hazardous conditions such as freezing rain, heavy snow or rain, blizzards, gales, and severe cold were expected to endanger life and property, and marine warning were issued for coastal areas when wind speeds of dangerous intensity were expected. These warnings were provided direct to conservation authorities, public utilities and civil defence organizations, and were widely distributed through the press, radio and television.

Late spring and early fall frost warning services were provided for fruit growers in the Okanagan, Niagara and Annapolis areas, and for tobacco growers in southern Ontario, and special advisory services were provided to agriculturists in southern Ontario and the Maritimes during critical growing periods.

During the growing season, special weather bulletins and advice for Alberta farmers were provided as a co-operative effort of the Alberta Department of Agriculture and the Edmonton Forecast Office.

Ice forecast and advisory services were provided for marine operations in the ice-infested waters on the Gulf of St. Lawrence, Cabot Strait, Strait of Belle Isle, Newfoundland and Labrador coastal waters, Hudson Bay, Hudson Strait, and in Arctic areas where shipping was engaged in annual resupply of weather stations and other sites.

Aviation Weather Service

In addition to forecasts issued four times daily for aerodromes and aviation regions covering most of Canada, forecasts for the North Atlantic and for a strip across southern Canada were provided to serve trans-Atlantic flights at medium and high altitudes and trans-continental jet flights.

Aerodrome forecasts were issued on a routine basis for international aerodromes and distributed to points as far afield as Europe, Asia, Central America, and the Caribbean.

Exchange of Area Forecasts—Under agreement with the United States Weather Bureau for exchange of area forecasts, arrangements were made to obtain by facsimile routine forecasts covering routes to Asia, Honolulu, Central America, the Caribbean and the United States, thus eliminating duplication in Canadian offices.

Development—In co-operation with the Telecommunications and Electronics Branch, arrangements were made for a continuous recorded broadcast of aviation weather reports, forecasts and warnings in the Toronto area. Designed to serve the needs of general aviation operations from areas in southern Ontario which do not have connections to the meteorological teletype system, it will also serve as a pilot project for similar installations across Canada.

Communications

The meteorology teletype system was increased from 54,000 to 55,300 miles of circuit, serving 350 stations equipped with 533 connections.

An experimental auto-call system was placed in operation on the Windsor-Montreal circuit to enable automatic collection of tapes prepared at reporting stations. This has been sufficiently successful to foresee the extension of a more refined auto-call system to all 100-series circuits.

Programmed teletype circuits replaced drop connections to the U.S. Service "A" system area of circuits at Vancouver and Toronto, so that the exact data required can now be drawn from the U.S. high-speed system. Data relayed to Canadian circuits can also be speeded up by use of the priority feature available in the U.S. high-speed to program circuit read-out.

The Canadian weatherfax system has 14,600 air-line miles of circuit serving 71 stations equipped with 87 connections.

During the year, under agreement with the United States Weather Bureau, arrangements were made to relay charts from their high altitude circuit to the Canadian supplementary weatherfax circuit. Canada will thus rely on U.S. charts for coverage of the area of their agreed responsibility. The United States will arrange to relay Canadian charts into their system, and will likewise rely on Canadian forecasts for the Northern continental area and the Arctic Ocean.

Research

An advisory committee consisting of representatives of the National Research Council, the Defence Research Board, the Ontario Research Foundation and the Meteorological Branch met towards the end of the year to consider 24 applications for grants in aid of meteorological research totalling \$200,000 from 14 Canadian universities. Of this number, 11 were recommended for support in the amount of \$86,000 in the fiscal year 1963-64.

Air Pollution and Turbulence—Routine co-operation continued with the Occupational Health Division of the Department of National Health and Welfare; Atomic Energy of Canada, Ltd.; the Provincial Governments of New Brunswick, Nova Scotia, Quebec, Ontario, Manitoba, Saskatchewan, and Alberta; the cities of Hamilton and Vancouver; National Research Council; the Ontario Research Foundation; and the St. Clair River Research Committee.

Atomic Energy of Canada constructed a 200-foot meteorological tower at Whiteshell, Man., and arranged for training technicians in the operations and maintenance of equipment.

During the summer of 1962, detailed micrometeorological studies were carried out at Douglas Point, Ont., the site of the nuclear power reactor, CANDU, on a much broader scale than in the previous year. The results of the investigations have been published in the report, *The Micrometeorology of Douglas Point, Ont., Progress Report No. 2*.

In November the Air Pollution and Turbulence unit took part in a joint field study conducted by the Occupational Health Division of the Department of National Health and Welfare and the National Research Council. The portable micrometeorological system was located at the National Research Council Montreal Road site in Ottawa during diffusion trials to compare the results of a wind tunnel study with actual atmospheric conditions.

The Ontario Department of Health has requested assistance in their study of trans-border flow of pollutants in the Niagara Peninsula and organization of the data is under way.

For the Federal Department of Mines and Technical Surveys' proposed telescope in the vicinity of Mt. Baldy in southern British Columbia, a detailed study of low-level turbulence field in the area is required because of its effect on the "seeing" of the telescope. Preliminary plans for a "pilot study" have been completed for the Richmond Hill Observatory in Toronto.

Precipitation Physics Project—Begun in 1959, the purpose of the project is to find out the basic causes of rain and other related information. As in previous years, the operational phase was conducted between May 15 and September 15, during which the aircraft flew 82 hours on cloud-seeding or investigation flights. The remainder of the year was devoted to analysis of the data collected and planning next year's operations.

Alberta Hail Project—Begun in 1956 to determine the causes of the destructive Prairie hail storms and possible means of combatting them, the project was continued throughout the year. During the operational season, June 1 to September 1, as in previous years, a great deal of information was collected through such methods as the use of radar to study these storms, cloud photographs to record their development, hail reports from farmers to provide information on the paths and intensity of the storms, and studies of individual hail stones.

Ozone—At Goose Bay and Churchill, two of an eleven-station network extending from Panama to Thule, ozone soundings of the upper atmosphere are being taken on a one-per-week basis, in co-operation with the Geophysical Research Directorate of the U.S. Airforce.

Great Lakes—Great Lakes research continued with investigations centered in the observational program of the research vessel CCGS *Porte Dauphine*, and the special research project at Douglas Point on Lake Huron. The scope of lakes

research was enlarged considerably during the year with the formation of an international committee on lake effect storms and also the formation of the Lake Erie study group, an informal committee of United States and Canadian agencies interested in an intensive investigation of Lake Erie.

Eastern Rockies Watershed Project—The purpose of this project, which is well under way, is to determine the effects of vegetation on the water balance of the region for possible improvement of the flow of the Saskatchewan River.

Arctic Climatology—Because of the increasing interest in the influence of climate on frost action in soils and ice in navigable waters, investigations on freezing and thawing indices for Northern Canada were extended to central sections of the country. Studies were also made of suitable weather for high level aerial photography of ice in the Gulf of St. Lawrence and on the frequency of critical winds affecting ice movement into Sydney Harbour, N.S.

Numerical Weather Prediction

Development work in numerical weather prediction was extended to forecasting models which use data from, and produce forecasts for, three levels in the atmosphere—sea level, 10,000 feet and 30,000 feet. The completed version of the Godson statistical dynamical model was transferred to the Central Analysis office for operational development.

Hydrometeorology

Major investigations completed during the year included large scale studies of critical meteorological conditions for maximum floods for the Quebec north shore region, including the Manicouagan and Outardes River basin, and for the Saint John River in New Brunswick. Another study dealt with the frequency and severity of winter rain storms over the lower Fraser River valley, this for drainage design problems in the area.

At the end of the year, a study was under way on frequency of heavy rain-falls in Ontario of durations of three to 72 hours.

Microclimatology

A final report outlining the meteorological conditions associated with tobacco fleck was made and, as a result of the satisfactory findings, the project has been discontinued. The project had been undertaken in collaboration with the Federal Departments of Agriculture and of National Health and Welfare.

In collaboration with the Ontario Agricultural College at Guelph, extensive experimental work was carried out on leaf wetness. This project was undertaken as a result of the interest of agriculturalists in dew as a factor in the development of fungus diseases, and of the World Meteorological Organization's recommendation that a concentrated effort be made to gain a full understanding of the formation of dew and that methods be developed for determining the amount and duration of water deposited on plants.

The study of micro- and meso-climatological conditions affecting fruit growing in areas north of Lake Erie and east of Lake Huron continued. Both investigations are being carried out in collaboration with the Ontario Research Foundation.



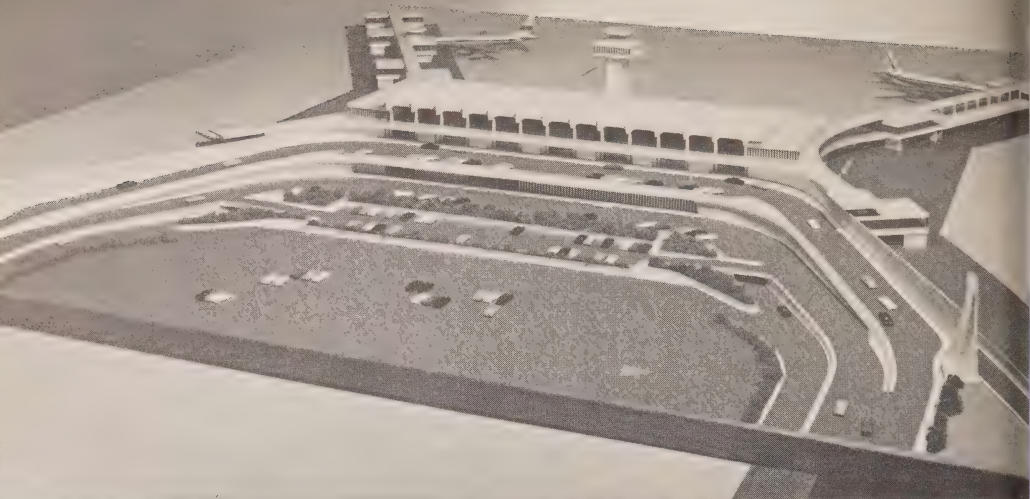
New lighthouse at Yarmouth, N.S.



M/V Taverner launching at Collingwood, Ont.



D.O.T. meteorologist, working towards a postgraduate degree, processes meteorological data in the computing room of the new Department of Meteorology, McGill



Architect's model of the department's new passenger terminal
to be constructed at Vancouver International Airport



Air terminal building, Charlevoix, P.Q.

Opening day at Charlevoix Airport, P.Q.



Edmonton International Air Terminal
construction



Canadian Coast Guard Ships landing cargo at Hall Lake, N.W.T.

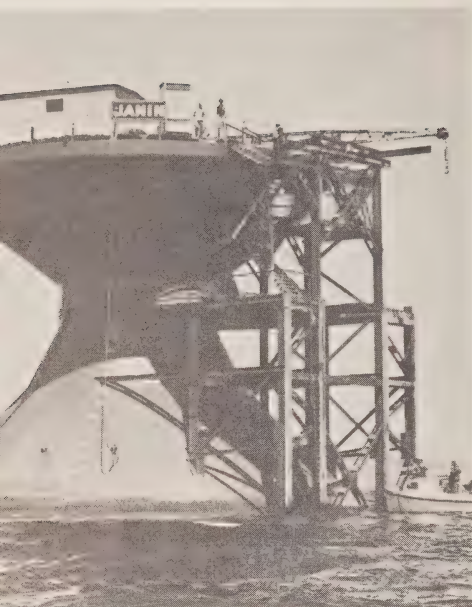
Weather computer at the Meteorological Central Analysis Office, Montreal International Airport



Meteorological station at Hall Lake, N.W.T.

Precision Approach Radar (PAR) at Montreal International Airport

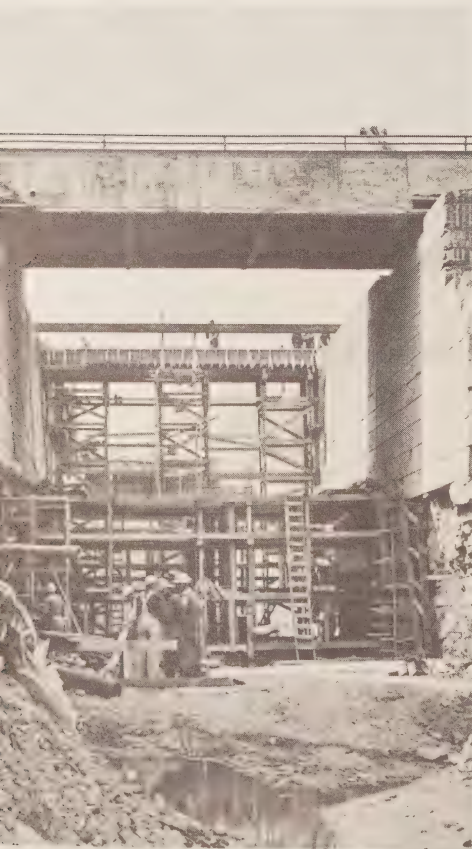




ghthouse construction at Prince Shoal, P.Q.



Icebreaking in the Gulf of St. Lawrence,
March 1963



Fenelon Falls, Ont., lock construction



For the proposed forest project in connection with regeneration of forests to be undertaken in collaboration with the Federal Department of Forestry, studies were made of methods of approach and instrument requirements.

Arctic Weather Stations

The basic meteorological program at each of the Joint Arctic Weather Stations—Resolute, Mould Bay, Isachsen, Eureka, and Alert—consisted of eight synoptic weather observations, two upper wind observations using pilot balloons, and two upper air ascents per day. At Alert, Eureka, Isachsen and Mould Bay, the program was increased by hourly and special surface observations during periods of unusually heavy flying activity such as during the re-supply airlift and when scientific expeditions were operating in the vicinity during the summer months. At Resolute, hourly and special surface weather observations were carried out on a regular basis.

Scientific projects at these stations included measurement of tides and sea-ice thickness, observations of snow temperature gradient and the physical characteristics of snow both surface and profile. An automatic tide gauge with the recorder remoted at the weather station was operated at Alert. The soil temperature measurement program to a depth of 650 feet and measurement radiation, turbulence and ozone were continued at Resolute. Seismic and magnetic observatories were in operation at Alert and Mould Bay throughout the fiscal year.

Upper Air Observations

Upper air observations of atmospheric temperature, pressure and relative humidity and wind measurements were undertaken at 32 upper air stations. These observations are essential for preparing various weather forecasts required by modern aviation and other civilian and military requirements and for preparing data for the climatology of the upper air.

Work continued in trying to improve the heights attained regularly by aerological balloons in order to achieve a goal of 100,000 feet on a regular daily basis at all stations. As yet, balloon manufacturers have been unable to produce a fabric which will combine all the qualities of a good aerological balloon, including ease of handling, ascent rate, size and shape, at a reasonable cost. At present, several types, of balloons are used, each suited to specific weather conditions such as high winds, icing, day and night, as well as summer and winter.

At Port Hardy, Coppermine and Frobisher, seismic vaults were under construction, an observing program was undertaken at Port Hardy and similar programs are to follow at the other two sites.

A seismic vault was completed at the upper air training school in Scarborough and practical training in observations was incorporated in the regular upper air training program.

A prototype model of the electrolysis type of hydrogen generator was completed and delivered for installation at Scarborough where it will be operated for several months before undertaking large-scale production for field use.

Meteorological Inspections

Inspections included 1,163 synoptic, aviation, and climatological stations, and 642 visits to stations to install new equipment, service, repair or replace

instruments, to instruct observers, or to make surveys to determine the suitability of proposed observing sites.

The ninth meteorological inspectors conference was held in Toronto from May 7 to 18. These conferences are held to ensure uniformity in inspection procedures and to assist in maintaining observing practices in accordance with World Meteorological Organization standards.

Marine Weather Observations

At the end of the fiscal year, 95 merchant and other vessels were making voluntary marine weather observations under the supervision of the Branch. During 1962 these ships made approximately 27,500 observations, an increase of 2,500 over the previous year.

On January 1, 1963, in accordance with a resolution of the Third Session of the WMO Congress, the system of temperature reporting on all ships observing for Canada, along with other countries including the United States, was changed from the Fahrenheit to the Celsius system.

In 1962, a network of 15 points along the St. Lawrence Seaway was established to record daily measurements of water temperature. This is a continuing program and the data are used in the prediction of ice formation along the Seaway.

Ice Reconnaissance and Observing

In ice observing and reconnaissance to aid marine transport and associated projects, 18 observers completed 660 missions totalling 3,163 flying hours. Aerial ice reconnaissance over the Eastern seaboard was carried out from field units at Sydney, N.S., and Gander, Nfld. The aircraft were equipped with airborne radar and Decca navigator systems to supplement existing observing techniques, which added considerably to the precision of ice information.

Two joint U.S.-Canadian projects, TIREC and BOLD SURVEY, were completed during the year. The first was a study to lay a foundation for future use of meteorological satellites for ice surveillance, and the second was concerned with the application of an infra-red scanner and radiometer for ice reconnaissance purposes.

Air Services Training

Graduates from the Air Services school at the Ottawa Airport totalled 641, and the types of courses presented increased from 11 to 21. Of these students, 122 were graduated from the basic radio operating course, and 96 radio technicians were given specialized equipment training in various fields including Decca navigator, teletype automatic error correcting equipment, aeronautical ground radar, marine radar, weather and flight checking procedures. A French course in marine radio beacon maintenance was arranged for eight lightkeepers.

The M.A. course in meteorology, given in co-operation with the University of Toronto, graduated five students in May 1962. The course that began in September 1962 had eight students, one of whom was a meteorologist from the Philippines under the External Aid Program. The first M.Sc. class in meteorology at McGill University graduated seven students in December and six of these were given a course in forecast training during January and February.

Meteorological Officers course #19 began in July 1962 with 57 students, the largest of these classes to date. Forty-two graduates were sent to Trenton in January 1963 for the final phase of their training.

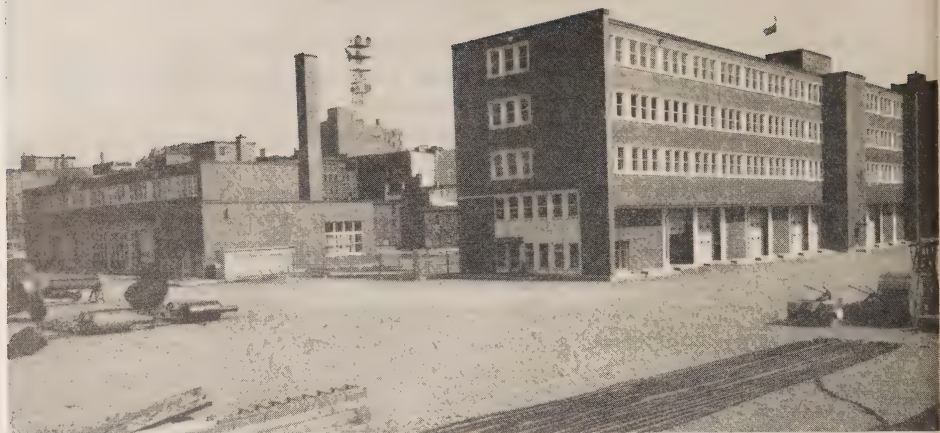
A correspondence course, *Vector Analysis for Meteorologists*, was conducted during the fall and winter months for a total of 18 meteorologists and meteorological officers, and was still in progress at the end of the fiscal year.

In November, an Israeli meteorologist studied for a month with the Climatology Division while on a WMO Fellowship in climatological statistics.

In March, two Nigerian meteorologists started a three-month technical training course in the methods and procedures of machine processing of climatic data under the Special Commonwealth African Aid Program.

Of the 2,745 pilots issued with private pilot licences, 1,239 were trained under the scheme of assistance sponsored by this Department. Thirty-nine flying clubs and 80 flying schools participated in this training program.

Two flying instructor refresher courses were sponsored by the Department. These courses, managed jointly by the Royal Canadian Flying Clubs Association and the Air Transport Association of Canada, are designed to maintain a high standard of pilot training. A total of 60 instructors were graduated from the two courses.



District Marine Agency, Saint John, N.B.

MARINE SERVICES

Aids to Navigation

Progress continued in converting oil-burning lights to automatic types. Of the 3,311 lights in operation, 2,925 are now automatic compared with 2,736 last year. Other navigation aids included 413 fog signals of various types, three lightships, and approximately 11,600 buoys, beacons and markers.

The buoys included 1,057 light, 61 sound and 362 light and sound. Maintained on charted positions throughout the shipping season, the buoys are regularly checked by masters and officers of departmental vessels and inspecting officers from the District Marine Agencies.

In areas where navigation closes for the winter, the buoys are lifted and stored, and, where required, specially designed ice buoys are placed for the benefit of late shipping.

In secondary channels and isolated locations, minor buoys, bushes, stakes and other markers are maintained under contract, some 300 of which were in force during the year. These minor services are checked periodically by Marine Agency inspecting officers.

Construction

The crib for the new lighthouse pier and superstructure at Prince Shoal, P.Q., which will replace the present lightship, was sunk in place and filled with concrete. The superstructure and installation of the light and fog signal equipment is expected to be completed during 1963.

Additional aids for the St. Lawrence Seaway included 10 light piers to mark the new Southeast Bend navigation channel in the St. Clair River, and seven sets of range lights to mark the channels in the Beauharnois Canal and Lake St. Francis.

Thirty-four new dwelling units, seven fog-alarm buildings and six major lighthouse towers were constructed by contract under the supervision of depart-

mental engineers, either to replace obsolete lightstation structures or to provide additional dwelling accommodation.

Plans for the improvement or replacement of District Marine Agency facilities progressed and a contract was awarded for the construction of a new Agency Depot administration, stores and shops building at St. John's, Nfld. Similar work is being planned for Charlottetown, P.E.I., Prescott, Ont., and Victoria and Prince Rupert, B.C., and completed at Dartmouth, N.S., and Saint John, N.B.

The new Agency Depot wharf at Charlottetown, P.E.I., was 30 per cent completed, and the construction of an extension to the Agency wharf at Dartmouth, N.S., was started.

In addition to these major projects, several new minor lighthouse towers were constructed and the regular repair program was continued.

Electrical and Mechanical Equipment

The photometric laboratory in Prescott is demonstrating its value in the rapid measurement of light intensities and experimenting with new types of lamps and optics. Mercury vapour lamps have proven to be an advantage over incandescent lamps, since they give a higher intensity per unit of power and, with a two- to three-year life, eliminate a lamp changer, minimizing maintenance.

The Xenon light for Prince Shoal, P.Q., has been demonstrated and accepted, and is now at the Quebec Agency for study by the mechanics who will be responsible for its maintenance.

New remote control methods being studied include one at Bar Point Light near Amherstburg, which is proving successful, and another for Pelee Passage in Lake Erie is in the final testing stages at Prescott.

Tests of a thermoelectric generator which converts propane gas heat directly into electricity, undertaken by the National Research Council, are nearing completion.

Equipment was acquired for the lighthouse at Prince Shoal, and at a number of Agencies, motor vehicles, trucks and tractors were supplied to replace those which were beyond economical repair. A few minor but essential pieces of machinery were supplied for the new workshops at Saint John, N.B., and the new machinery purchased last year for Prescott is now in operation.

St. Lawrence Ship Channel

Four barges were added to the fleet of five survey and inspection vessels to cope with increased activity in hydraulic surveys.

The hydraulic model at Ville LaSalle was completed and verified, and testing was carried out on several channel improvement schemes.

Construction—The one-year contract awarded to McNamara Marine Ltd. in 1961 for widening Cap de la Madeleine-Becancour stretch to 800 feet was extended for completion in 1962 and was available to navigation by the end of August. Deepening the channel downstream from Pointe a l'Îlet Anchorage (Saguenay-Chicoutimi) was also completed.

Of a three-year contract for 800-foot widening between Trois Rivières and Cap Charles, from Trois Rivières to Cap de la Madeleine was completed, Cap a la Roche Curve was 30 per cent completed and Cap Charles Channel and Curve was five per cent completed.

A National Harbours Board contract for widening Racine Channel and removing the upstream end of Longue Pointe Shoal to improve the approach to a wharf development in Montreal Harbour was completed. Other work carried out for the National Harbours Board included dredging operations in Montreal Harbour under the supervision of Ship Channel engineers, and maintenance surveys and sweeping in the St. Charles River and Wolfe's Cove in Quebec Harbour, and at all the berths in Trois Rivières Harbour.

In addition to maintenance sweeping in the non-canal reaches of the Canadian section of the St. Lawrence Seaway between Montreal and Lake Ontario, including the Seaway entrance in Montreal Harbour, Ship Channel staff supervised capital cleanup operations in the channel between Section B and Sparrowhawk Point.

Canals

The Quebec Hydro dam was still under construction and, therefore, the Carillon and Grenville Canals remained closed. The new canal is scheduled for opening early in 1963. Pleasure boat traffic continued to rise, with the Rideau and Trent Canals again showing substantial increases. Total lockages through the Trent were 91,725 compared with 82,849 the previous year, and through the Rideau, 43,223 compared with 42,320.

Freight traffic through the Canso Canal exceeded one million tons compared with some 700,000 the previous year.

Construction and Engineering—Substantial progress was made in the program of modernizing and rehabilitating the Trent Canal system, and a contribution of \$20,000 was made to the County of York in connection with the Yonge Street bridge.

At Fenelon Falls, 85 per cent of the general contract was completed and the steel work was 25 per cent complete.

Other work on the system included concrete rehabilitation at both the Peterborough and Kirkfield lift locks.

Work on the Rideau Canal included dredging the Cataraqui River channel; completing the bridge at Old Slys Falls; completing a new overhead bridge at Beveridges and removing the old swing bridge; rebuilding the approach wharf at Smiths Falls combined lock station and repairing a number of other wharves along the system.

On the Nova Scotia canals, work included constructing a 680-foot security fence for public protection, grading and paving a public parking area, and additional landscaping at Canso; and replacing a 180-foot section of retaining wall at St. Peters.

Harbours and Property

Public Harbours—During the year, the harbours at Port Burwell and Port Hope, Ont., and Baie Comeau, Que., were proclaimed under the *Canada Shipping Act*. There are now 311 public harbours so proclaimed and controlled by the Department, 113 of which are in charge of harbour masters, who enforce the *Public Harbours Regulations* authorized by the Governor in Council. Harbour dues collected for the year amounted to \$264,809, an increase of \$32,367 over the previous year.

Wharves—There are some 3,000 wharves, piers, and breakwaters under the administration of the Department, 483 of which are in charge of wharfingers. Revenue from wharf properties amounted to \$1,033,005 compared with \$1,037,423 last year.

Water Lots—Water-lots leases and licences in effect totalled 1,908, yielding a revenue of \$225,200.

Steamship Inspection

Ship inspections carried out included 136 new ships completed in Canada, 63 converted or reconditioned, five built outside Canada for Canadian registry, and six existing ships built outside Canada and transferred to Canadian registry. In addition, 1,642 Canadian registered vessels and 42 registered elsewhere, totalling 1,732,765 gross tons, were inspected. Of these, 524 were passenger ships totalling 242,127 gross tons.

Recommended standards for control of gas hazards in ships to be repaired or altered were issued in November, and the *Handbook of Approved Diesel Engines and Reduction Gears* was completely revised, with 37 models of diesel engines and 18 of reduction gears added.

Seven accidents and four fatalities in connection with ships loading and unloading were investigated.

Inspection of ships tackle numbered 4,203, of which 268 required repairs, adjustments or testing of cargo handling gear.

Newfoundland—Invitations to tender for a marine haulout at Clarenville were advertised during the year, but a proposed dry docking facility at Lewisporte has been postponed indefinitely.

Water Safety

During the year, the Department made it compulsory for small boats to carry load and capacity plates. From July 1, the effective date, the number of plates issued to individual applicants totalled 79,902, and an additional 19,320 were issued to boat manufacturers.

Two hundred and sixty thousand copies of the booklet, *Safety Afloat*, were distributed, and a water safety display was exhibited at boat shows in Montreal and Ottawa.

Lifejackets

Meetings were held with industry to discuss improved lifejacket designs for both commercial and pleasure craft, and new specifications and appropriate amendment to the existing regulations are under preparation.

Pollution

Oil Pollution—There were seven prosecutions under the *Oil Pollution Prevention Regulations* and convictions were secured in all but one case.

A helicopter patrol of the St. Lawrence River area was instituted, using departmental aircraft carrying steamship inspectors.

Air Pollution—A draft of the proposed air pollution regulations for the prevention of pollution by ships' smoke was submitted for comment to air pollution control authorities, harbour boards and commissions, shipowners and others concerned.

Training

Candidates for certificates of competency for marine engineers totalled 1,075, of which 847 were successful and 165 received partial passes.

Two more trainees in the marine engineer training scheme received their fourth class combined certificates, terminating their apprenticeship for service as junior engineers on Canadian Coast Guard ships, and two new trainees were engaged.

Revenue

Revenue collected, including inspection services and examinations fees, totalled \$261,849.

Pilotage

There were 379 licensed pilots engaged in pilotage in the ten districts for which the Minister is the pilotage authority. They performed 47,747 pilotages inward and outward and 10,806 movages, grossing \$5,650,691 in fees.

Labrador—Three pilots were employed during the navigation season to assist ships in and out of Goose Bay.

Port Weller-Sarnia—Under the *Prevailing Rate Regulations*, 41 pilots were employed to conduct ships from Port Weller to Sarnia. Pilotages totalled 3,517, grossing \$524,978 in fees.

The Lakehead and St. Mary's River—Three pilots were employed under the *Prevailing Rate Regulations* to conduct ships through the St. Mary's River and into ports on Lakes Huron, Michigan and Superior.

Royal Commission on Pilotage

On November 1, 1962, His Excellency the Governor General appointed the Hon. Yves Bernier, and Messrs. Robert K. Smith and Harold A. Renwick commissioners under Part 1 of the *Inquiries Act*, to inquire into and report upon the problems relating to marine pilotage in Canada.

Masters, Mates and Seamen

Examinations held for masters, and first and second mates certificates of competency and service totalled 834. In addition, 91 sight test examinations were held. A total of 364 masters, 99 first mates and 42 second mates were granted certificates, and 549 renewals of temporary certificates as masters were issued for which no examination was held.

In addition 68 masters, 12 first mates and five second mates were granted permission to serve for a limited time while holding qualifications inferior to those prescribed.

A total of 11 seamen received certificates of qualification as ship's cooks, and 153 qualified as able seamen.

Examinations were held and certificates of qualification issued for 238 masters and mates for Great Lakes waters.

Examination fees totalled \$12,711.

A total of 376 seamen were examined for certificates of efficiency as life-boatmen, of whom 352 were granted certificates.

Amounts received in connection with the relief, maintenance, and repatriation of seamen left behind at ports abroad totalled \$567, and amounts of \$1,503 and \$894 representing deserters wages and fines respectively, were received and deposited in the Consolidated Revenue Fund of Canada.

During the year, there were 33,391 engagements of seamen with, and 32,162 discharges from, ships of British registry at 102 Canadian ports.

Marine Casualties

Five marine casualty investigations were held under the *Canada Shipping Act*.

Canadian Coast Guard

One new ship, CCGS *Simcoe*, a light icebreaker buoy and supply vessel for service with the Prescott Marine Agency, was added to the fleet.

The fleet now has a total of 195 vessels of all types as follows: full icebreakers, 10; light icebreaker, supply and buoy vessels, 8; special Arctic service vessel, 1; Northern supply vessels, 6; Northern service depot ship, 1; lighthouse supply and buoy vessels, 10; Mackenzie River shallow draft buoy vessels, 3; lightships, 3; St. Lawrence Ship Channel survey, 4; weatherships, 3; Great Lakes marine and meteorology research, 1; shore-based lifeboats, 3; workboats, 11; steel landing craft for Northern service, 131.

The fleet is distributed among the 11 Marine Agencies and the St. Lawrence Ship Channel for administration and during the year the following transfers were made to serve operational requirements better: CCGS *Simon Fraser* from Victoria to Quebec; CCGS *Montmorency* from Quebec to Newfoundland; CCGS *Wolfe* from Newfoundland to Charlottetown; and CCGS *Saurel* from Charlottetown to Quebec.

Northern Operations

Icebreaker support was again provided for merchant ships proceeding to Churchill. The first ship arrived on July 26 and an ice operations officer remained at Churchill throughout the season to give advisory service to all ships trading into the Hudsons Bay and Straits. A total of 49 vessels loaded 21,500,000 bushels of grain, the final ship clearing Churchill on October 11.

Forty-four ships, steaming some 275,000 miles, carried 114,745 short tons of cargo to approximately 70 ports of call during the Department's annual Arctic resupply operations. In addition, aids to navigation were serviced, DF stations were calibrated, and medical and administrative work for the Departments of National Health and Welfare and of Northern Affairs was carried out by the Arctic patrol vessel, CCGS *C. D. Howe*. The Canadian Coast Guard ships also carried out hydrographic and oceanography surveys.

Ice conditions were generally easier than usual and after resupplying Eureka Arctic Weather Station, CCGS *John A. Macdonald* proceeded to the head of Tanquary Fiord and through to the Polar ice barrier at the west end of Nansen

Sound, reaching a position further west in McClure Sound than any departmental ship had hitherto attained. During her voyage, the *Macdonald* circumnavigated Prince of Wales Island, a first for any ship.

Winter Icebreaking

Throughout the winter season, an ice operations office, set up on the Government Wharf at Sydney, N.S., co-ordinated the movements of the icebreakers and merchant ships in the Gulf of St. Lawrence and the northeast coast of Newfoundland.

The season was relatively mild and of 488 ship passages reported, icebreaker assistance was called upon 189 times, the remainder requiring routing instructions only.

The publication, *Guidance to Merchant Ships Navigating in the Gulf of St. Lawrence*, was again widely distributed.

Three icebreakers were assigned to opening and maintaining a channel from Quebec to Montreal for flood control purposes only. A fourth vessel assisted during breakup period. The Saguenay River was opened during the second half of March. Above Montreal, icebreaking was necessary on Lake St. Louis and part way up the Beauharnois canal.

Water level in Montreal Harbour reached a high of 19'10" on January 24, then receded following the forming of an ice cover in Laprairie basin.

Weatherships

Both CCGS *Stonetown* and *St. Catharines* continued to maintain a continuous patrol at Pacific Ocean Weather Station "P".

Crew Training

Arrangements were made with the Royal Canadian Navy for advanced training in navigation, particularly in the use of radar and other modern aids. The first course, of two weeks duration, was held at HMCS *Stadacona*, Halifax, in November, with 14 ships' officers from Quebec and East Coast Agencies attending.

Fourteen ships' officers attended a short course in marine weather observing given by meteorological officers at Quebec, and nine at Dartmouth.

During the year, correspondence courses in navigation were offered to seamen wishing to attain officer status, and in engineering to engine-room personnel, in which 121 ships' crew have enrolled.

Eight chief stewards attended a special management course held at HMCS *Hochelaga*, two of whom have since been promoted to the new position of purser.

Ship Construction

During the year, six vessels were completed, 16 were under construction and 11 were in the design stage.

Vessels completed were: CCGS *Simcoe* for Bay of Quinte service; a passenger-cargo vessel, *Taverner*, for the Canadian National Railways Newfoundland coastal service; an automobile and passenger ferry, *Confederation*, for the C.N.R. Cape Tormentine, N.B.-Borden, P.E.I. service; a tug, *W. N. Twolan*, for National Harbours Board service at Churchill; a protection vessel, *Cape*

Freels, for Fisheries Department service in the Maritimes; and a research vessel, *G. B. Reed*, for Fisheries Research Board West Coast service.

Under construction are: a supply and buoy vessel, *Montmagny*, for service at Sorel, Que.; five 95-foot search and rescue cutters, *Relay*, *Rally*, *Rapid*, *Racer* and *Ready*, for service in Eastern, Western and Central Canada; three 66-foot search and rescue cutters, *Spume*, *Spray*, and *Spindrift*, for service in Central Canada; a depot vessel, *Narwhal*, for service in Northern areas; a cable repair and icebreaking vessel for service on the East Coast; two tenders, one for Prescott and one for Prince Rupert; a shallow draft vessel, *Tembah*, for service on the Mackenzie River; and for the Department of Fisheries, one 95-foot patrol vessel, *Hunter Point*, for service on the West Coast, and a bait vessel for service in Newfoundland.

In the design stage are: two weatherships for the Pacific Ocean Weather station; a triple screw icebreaker for service in the Maritimes and Northern areas; a tender for the Lakehead; icebreaking supply and buoy vessel replacements for the *Chesterfield* and *Saurel*; an icebreaking supply and buoy vessel for the Gulf of St. Lawrence; a ferry vessel for Canadian National Railways service between Argentia, Nfld., and Sydney, N.S.; a personnel boat, *Kitandoh*, for the Civil Aviation Branch for service on the West Coast; a stern trawler for the Department of Fisheries for service in Pakistan; and a pilot boat for the External Aid Office for service in Barbados.

Repairs

Under the supervision of the Ship Construction Branch, repairs totalling \$3,466,850 were carried out on departmental ships.

RAILWAY SERVICES

Canadian National Railways

The Canadian National Railways operated at a deficit of \$48,919,454 in the calendar year 1962, compared with a deficit of \$67,307,772 the previous year.

Trans-Canada Air Lines

In the calendar year 1962, Trans-Canada Air Lines operated at a deficit of \$3,540,625, compared with \$6,450,082 in 1961, a decrease of \$2,909,457.

Prince Edward Island Ferry and Terminals

The Prince Edward Island ferry service operated at a deficit of \$3,275,166 in 1962, compared with \$2,984,552 in 1961, an increase of \$290,614.

The new ferry, M.V. *Confederation*, commenced operating between Tormentine, N.B., and Borden, P.E.I., on May 5, 1962. Payments towards the cost of the ferry amounted to \$726,061.27. The sum of \$102,491.57 was spent on the docks at Borden, and \$116,397.80 on the docks at Tormentine.

Vehicle traffic between Prince Edward Island and the mainland continues to increase. In 1962 some 199,189 highway vehicles were handled, compared with 178,474 the previous year, an increase of 20,715 or 11.6 per cent.

Rail freight handled for the same period amounted to 662,827 tons compared with 672,488 in 1961, a decrease of 9,661.

Newfoundland Ferry Service

In addition to the regular freight and passenger service operated between North Sydney, N.S., and Port aux Basques, Nfld., a freight service only was operated throughout the year between North Sydney and various other Newfoundland ports as required. These services operated at a deficit of \$8,180,394 in 1962, compared with \$7,270,792 the previous year, an increase of \$909,602.

Docks and Terminals—Expenditures for additions and betterments to the terminal facilities at North Sydney amounted to \$36,960 during the fiscal year, and at Port aux Basques, \$91,609.

Yarmouth, N.S.-Bar Harbor, Me., Ferry Service

Traffic handled during 1962 consisted of 86,192 passengers, 25,641 automobiles, 2,762 trucks and 504 other highway vehicles, a decrease of about three per cent in volume compared with 1961.

The service operated at a deficit of \$193,994.

Maritime Freight Rates Act

Payments under the Maritime Freight Rates Act during the fiscal year amounted to \$12,936,500, compared with \$12,209,476 the previous year, an increase of \$727,024.

Matane to Ste. Anne des Monts Railway

As a result of a location survey made of this project, the estimated cost of the line is now expected to be considerably in excess of the \$16,100,000 approved. An advance of \$70,000 was made to Canadian National Railways for the survey, but no advances are forecast for the year 1963-64.

Great Slave Lake Railway

This projected line commences at Roma near Grimshaw, Alta., and extends to Hay River, N.W.T., a distance of approximately 377 miles, with a branch to Pine Point Mines, a distance of approximately 53 miles.

The estimated capital cost of the line is \$86,250,000, which includes a 15 per cent allowance for contingencies. The Company will be paid a subsidy by the Canadian Government equal to the cost of constructing the line. Accountable payments for the year ended March 31 totalled \$12,225,000, bringing the total to date to \$12,725,000.

FINANCIAL SUMMARY

(Comparative Summary of Expenditures and Revenues)
(for the Fiscal Years Ended March 31, 1962 and 1963)

	Millions of Dollars		
	1962-63	1961-62	Increase (+) or Decrease (-)
<i>Administration, Operation and Maintenance Expenditures</i>			
Departmental Administration	3.6	3.5	.1 (+)
Air Services	77.4	76.5	.9 (+)
Marine Services	37.4	34.3	3.1 (+)
Railway and Steamship Services	90.0	97.6	7.6 (-)
Miscellaneous Services	119.2	100.6	18.6 (+)
	<hr/> 327.6	<hr/> 312.5	<hr/> 15.1 (+)
<i>Capital Expenditures</i>			
Air Services	59.5	73.5	14.0 (-)
Marine Services	20.4	14.3	6.1 (+)
Railway and Steamship Services	3.1	4.8	1.7 (-)
Miscellaneous Services .....	.2	.4	.2 (-)
	<hr/> 83.2	<hr/> 93.0	<hr/> 9.8 (-)
TOTAL DEPARTMENTAL EXPENDITURES	<hr/> 410.8	<hr/> 405.5	<hr/> 5.3 (+)
<i>Revenues</i>			
Air Services	19.4	18.0	1.4 (+)
Marine Services	7.0	5.2	1.8 (+)
Railway and Steamship Services .....	.4	.4	...
Miscellaneous Services .....	.1	.1	...
TOTAL DEPARTMENTAL REVENUES	<hr/> 26.9	<hr/> 23.7	<hr/> 3.2 (+)

EXPLANATION OF INCREASES AND DECREASES

***Administration, Operation and Maintenance Expenditures**

Departmental Administration

An increase of \$0.2 million in payroll items for departmental administration was partly offset by minor reductions in disbursements of a general nature.

Air Services

There was a nominal increase of just over 1% in the overall expenditures by Air Services. General and Construction Branch administration costs rose by \$0.1 million each while the Civil Aviation and Meteorological Branches were up by \$0.3 million and \$0.5 million respectively. The Telecommunications and Electronics Branch showed a net decline of \$0.1 million.

Marine Services

Headquarters and Agency administration together with amounts paid under Exchequer Court Awards rose by \$0.2 million. Expenditures for the Marine Works Branch included \$1.7 million for the write-off of the value of land purchased for development of the Cornwall Navigation System. There was no corresponding disbursement during 1961-62. Stevedoring services provided at Goose Bay, Labrador on a recoverable basis accounted for \$0.9 million of the \$1.2 million increase in the expenditures of the Marine Operations Branch.

Railway and Steamship Services

The operating deficits of the Canadian National Railways and of Trans-Canada Air Lines declined \$18.4 million and \$2.9 million but deficits on ferry operations and payments under the Maritime Freight Rates Act rose by \$1.3 million and \$0.7 million respectively. A subsidy of \$12.2 million was paid toward the cost of the construction of a railway line from Grimshaw, Alta. to Great Slave Lake. The corresponding amount for the last fiscal year was \$0.5 million.

Miscellaneous Services

Capital subsidies for the construction of commercial and fishing vessels amounted to \$22.5 million compared to \$2.0 million in 1961-62. Payments to companies as defined in the Freight Rates Reduction Act for the reduction of certain class and commodity rates on freight traffic increased \$1.6 million while payments to the Railway Grade Crossing Fund declined \$4.2 million. Amounts paid to the St. Lawrence Seaway Authority for the operating deficits of entrusted canals rose by \$0.4 million. This item was included with Marine Services in previous years.

* Salary revisions during 1962-63 resulted in an increase in expenditures for this category.

Revenues

Air Services

Revenues of the Civil Aviation Branch rose \$0.9 million including \$767,000 from the operation of Vancouver International Airport which was taken over by the Department of Transport on June 1, 1962. Amounts credited to revenue during the fiscal year 1962-63 and attributable to the operations of the Telecommunications and Electronics Branch were \$0.4 million more than in the previous year.

Marine Services

There was a recovery of \$0.4 million of the cost incurred during 1960-61 in the removal of the wreck of the M/V Federal Express from Montreal Harbour. Receipts from the earnings of the Canadian Coast Guard arising from northern supply operations were \$3.8 million compared to \$2.4 million in 1961-62.

Railway and Steamship Services

There was no change in revenue arising from the operations of the Railway and Steamship Services.

Capital Expenditures

Air Services

Due to curtailment of the original programme, expenditures on the construction or acquisition of buildings, works, land and equipment with respect to national airports declined \$8.9 million while disbursements of a similar nature for radio navigation aids were down \$5.6 million.

Marine Services

Expansion of the Canadian Coast Guard continued. Additional expenditures were incurred as construction progressed on eight search and rescue cutters, the depot vessel "Narwhal" and the cable repair and icebreaking vessel for service on the Canadian East Coast. At the year end fourteen vessels were under construction compared to eight the previous year.

Railway and Steamship Services

The passenger-cargo vessel "Taverner" for the Newfoundland Coastal Service and the auto-ferry vessel "Confederation" for service between Cape Tormentine, N.B. and Borden, P.E.I. were completed during the year with a consequent drop in expenditure.

Miscellaneous Services

The capital requirements of canals and works entrusted to the St. Lawrence Seaway Authority were \$0.2 million. The corresponding amount for 1961-62 was \$0.4 million.

DEPARTMENT OF TRANSPORT

AIR SERVICES

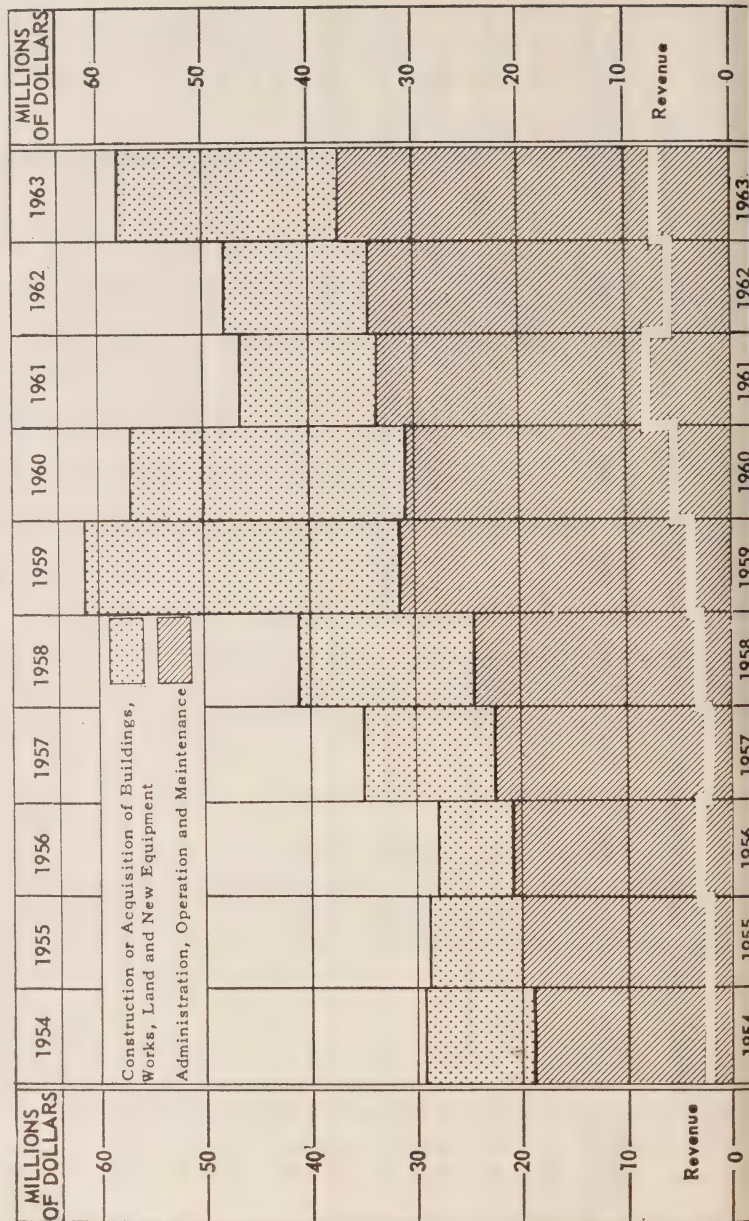
EXPENDITURES AND REVENUES FOR THE FISCAL YEARS 1953-54 TO 1962-63 INCLUSIVE

MILLIONS OF DOLLARS	1954	1955	1956	1957	1958	1959	1960	1961	1962	1963	MILLIONS OF DOLLARS
— 150.0 —											— 150.0 —
— 137.5 —											— 137.5 —
— 125.0 —											— 125.0 —
— 112.5 —											— 112.5 —
— 100.0 —											— 100.0 —
— 87.5 —											— 87.5 —
— 75.0 —											— 75.0 —
— 62.5 —											— 62.5 —
— 50.0 —											— 50.0 —
— 37.5 —											— 37.5 —
— 25.0 —											— 25.0 —
— 12.5 —											Revenue — 12.5 —
Revenue — 0 —											— 0 —

Construction or acquisition of buildings
works, land and new equipment

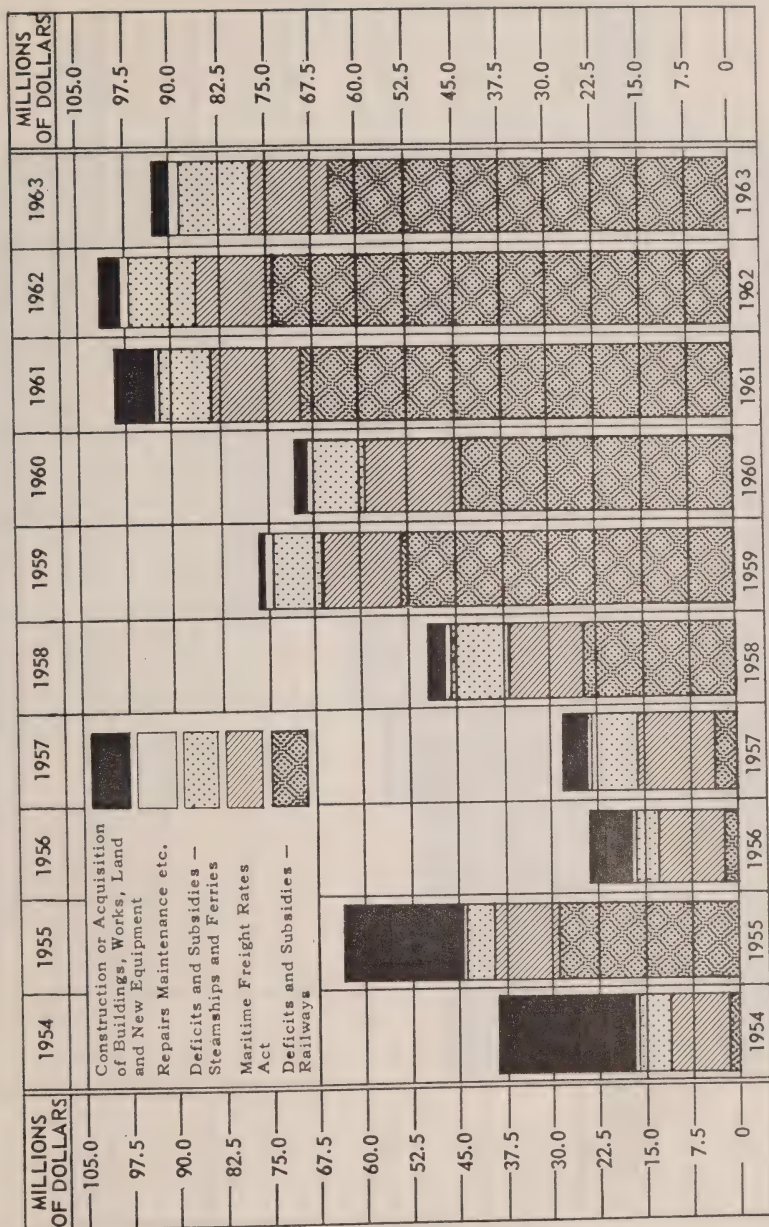
Administration, operation and maintenance

DEPARTMENT OF TRANSPORT
MARINE SERVICES EXPENDITURES AND REVENUES
FOR THE FISCAL YEARS 1953-54 TO 1962-63 INCLUSIVE

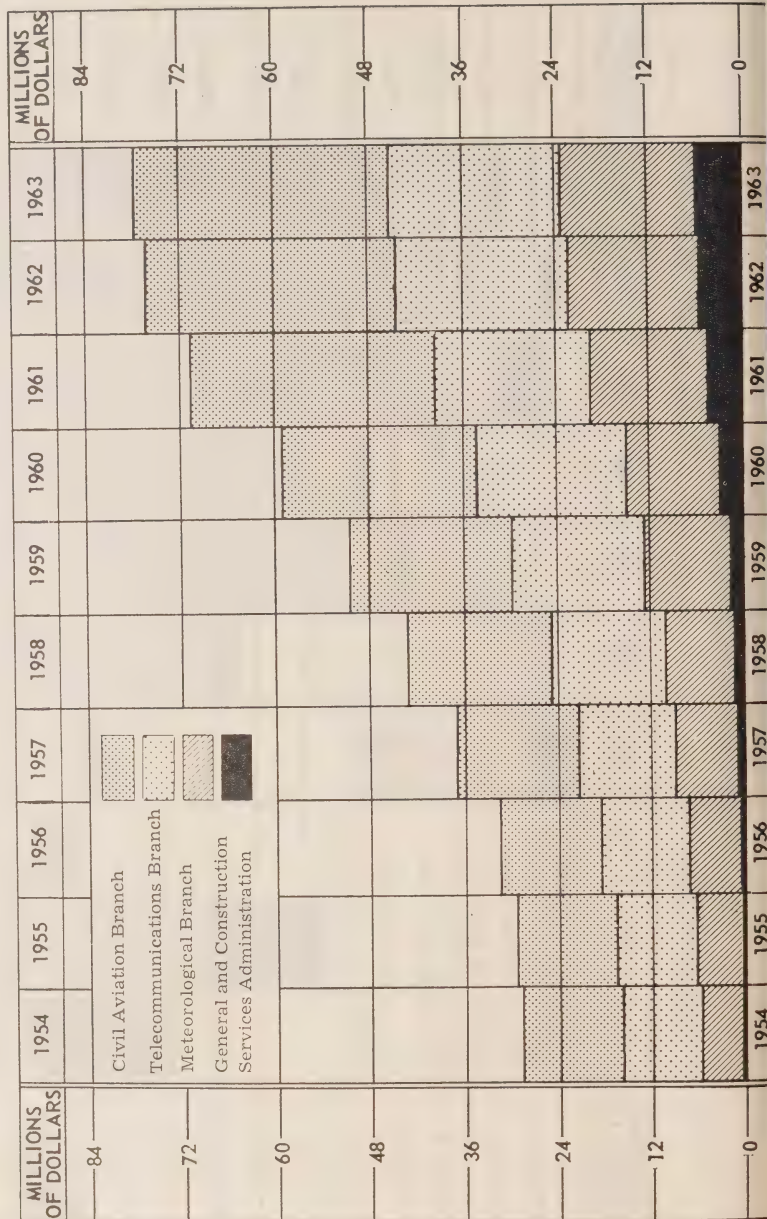


RAILWAY AND STEAMSHIP SERVICES

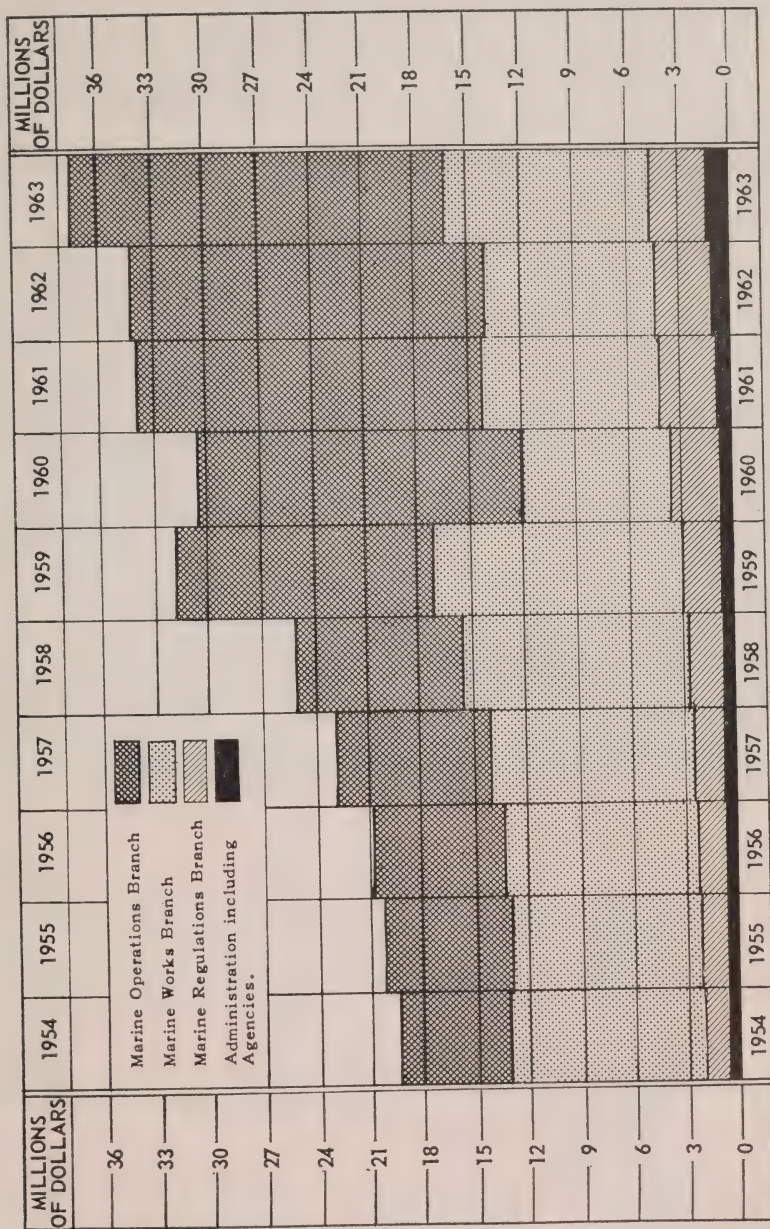
EXPENDITURES FOR THE FISCAL YEARS 1953-54 TO 1962-63 INCLUSIVE



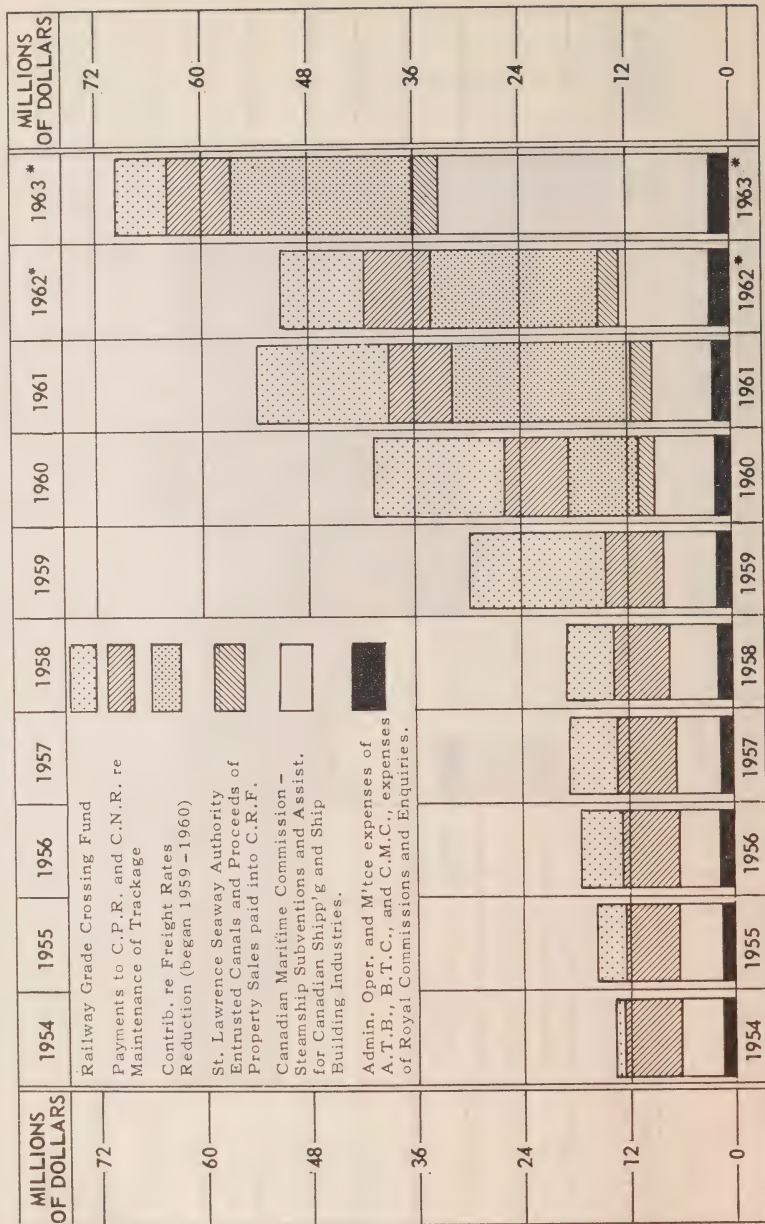
DEPARTMENT OF TRANSPORT
AIR SERVICES - ADMINISTRATION OPERATION AND MAINTENANCE EXPENDITURES
FOR THE FISCAL YEARS 1953-54 TO 1962-63 INCLUSIVE



DEPARTMENT OF TRANSPORT

MARINE SERVICES - ADMINISTRATION OPERATION AND MAINTENANCE EXPENDITURES
FOR THE FISCAL YEARS 1953-54 TO 1962-63 INCLUSIVE

DEPARTMENT OF TRANSPORT
MISCELLANEOUS SERVICES - EXPENDITURES
 FOR THE FISCAL YEARS 1953-54 TO 1962-63 INCLUSIVE





ANNUAL REPORT

FOR THE FISCAL YEAR ENDED MARCH 31, 1964

1963 - 1964

Department of Transport • Canada

ANNUAL REPORT
Department of Transport

COVER—Toronto International Airport Terminal.



CANADA

DEPARTMENT OF TRANSPORT

ANNUAL REPORT

FOR THE FISCAL YEAR ENDED

MARCH 31

1964

Submitted Under the Provisions of the
DEPARTMENT OF TRANSPORT ACT



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ROGER DUHAMEL, F.R.S.C.
QUEEN'S PRINTER AND CONTROLLER OF STATIONERY
OTTAWA, 1965

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*To His Excellency Major-General Georges P. Vanier, D.S.O., M.C., C.D.
Governor General and Commander-in-Chief of Canada*

MAY IT PLEASE YOUR EXCELLENCY:

The undersigned has the honour to present to Your Excellency the Annual Report of the Department of Transport, for the fiscal year ended March 31, 1964.

J. W. PICKERSGILL,
Minister of Transport.

MINISTRY OF TRANSPORT MINISTER

BOARDS, COMMISSIONS AND GOVERNMENT-OWNED COMPANIES

Air Transport Board
Board of Transport Commissioners
Canadian Maritime Commission
Canadian National Railway Company
Canadian Overseas Telecommunication Corporation
National Harbours Board
St. Lawrence Seaway Authority
Steamship Inspection Board
Trans-Canada Air Lines

ACTS ADMINISTERED BY THE DEPARTMENT OF TRANSPORT

GENERAL

Bills of Lading Act
Canadian Overseas Telecommunication Corporation Act
Department of Transport Act
St. Lawrence Seaway Authority
Telegraph Act
Transport Act

National Harbours Board Act
Navigable Waters' Protection Act
New Westminster Harbour Commissioners Act
North Fraser Harbour Commissioners Act
Oshawa Harbour Commissioners Act
Port Alberni Harbour Commissioners Act
Toronto Harbour Commissioners Act
Water Carriage of Goods Act
Windsor Harbour Commissioners Act
Winnipeg and St. Boniface Harbour Commissioners Act

AIR SERVICES

Aeronautics Act
Carriage of Goods by Air Act
Foreign Aircraft Third Party Damage
Radio Act
Trans-Canada Air Lines Act

RAILWAYS

Canadian National Railways Act
Canadian National-Canadian Pacific Act
Canadian National Railways Financing and Guarantee Act
Canadian National Montreal Terminals Act
Canadian National Railways Pensions Act
Canadian National Toronto Terminals Act
Government Railways Act
Intercolonial Railway and P.E.I. Railway Employees Provident Fund Act
Maritime Freight Rates Act
Railway Act

MARINE

Belleville Harbour Commissioners Act
Canada Shipping Act
Canadian Maritime Commission Act
Canadian National Steamships Act
Government Harbours and Piers Act
Government Property Traffic Act
Government Vessels Discipline Act
Hamilton Harbour Commissioners Act
Lakehead Harbour Commissioners Act
Live Stock Shipping Act
Nanaimo Harbour Commissioners Act

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Winnipeg International Airport Terminal

AIR SERVICES

Airports

All international and most of the major airports in Canada have been developed to accommodate long-range jet aircraft and are expected to meet the needs of this type of traffic in the foreseeable future. Some 16 other domestic airports are being developed to accommodate short/medium range aircraft of the DC-9 category, which major air carriers plan to put into service by 1966-67.

Development—Major contracts were awarded for construction of runways, taxiways, and aircraft aprons at Deer Lake, Nfld.; Halifax, N.S.; Saint John and Fredericton, N.B.; Matane and Sept Iles, P.Q.; Ottawa, Toronto, Earlton and Lakehead, Ont.; Thompson, Man.; Medicine Hat, Alta.; Abbotsford, Victoria, Fort Nelson and Terrace, B.C.; and Watson Lake and Whitehorse, Y.T.

At Halifax, Quebec, Montreal, Toronto, North Bay, Winnipeg, Edmonton, Calgary, Abbotsford, Vancouver, Kamloops and Pitt Meadows, major airport development projects were completed.

Major landscaping contracts were awarded at Toronto and North Bay, and development planning was either under way or completed for Fredericton, Sault Ste. Marie, Winnipeg, Edmonton and Victoria.

Engineering surveys were carried out for providing Air Services facilities at a number of sites including Wabush, Lab., and Trepassey, Nfld.; Halifax, Yarmouth and Mill Village, N.S.; Moncton and Fredericton, N.B.; Baie Comeau, Quebec, Val d'Or and Montreal, Que.; Toronto, Ottawa, London, and the Lakehead, Ont.; Winnipeg and The Pas, Man.; Edmonton and Medicine Hat, Alta., and Vancouver, Prince George and Westview, B.C.

Major Terminals—Three major air terminals were opened during the fiscal year. At Toronto, Aeroquay No. 1 was open to airline operations on January 11, 1964, and officially opened on February 28. The Winnipeg terminal was opera-

tional on November 12, 1963, and officially opened on January 17, 1964. Edmonton's new terminal was operational on December 3, 1963, and official opening ceremonies were held February 15, 1964.

At Vancouver, work on the pre-loading of the air terminal area and apron complex was completed in June 1963. Plans for the building are well under way and tenders are expected to be called early in 1965.

Standard Terminals and General Buildings—Contracts were awarded for terminal buildings at Fredericton, N.B.; London and Sault Ste Marie, Ont.; Yellowknife, N.W.T.; and Kamloops, B.C. A new terminal was completed at Penticton, B.C., and terminals at North Bay and Victoria are scheduled for completion during the summer of 1964. At Lakehead, Ont., a contract was awarded for extensions to the terminal.

Major projects completed included an operations building, power house, dwellings and an antenna tuning house at Cartwright, Lab.; a firehall at Montreal; combined maintenance garage and airport services building at Sault Ste. Marie; a maintenance garage and firehall at Windsor and Lakehead; and extension to the Regional stores building at Edmonton.

Various radio buildings and structures were completed at twenty-seven sites.

Other building projects completed or under way included re-roofing the Gander terminal building; fabrication and erection of weather towers at Halifax, Toronto, Winnipeg, and Edmonton; heating and ventilating facilities for the Halifax terminal; a maintenance garage and firehall at Quebec; Air Services Training School, comprising various office and radio buildings, at Carp, Ont.; a surveillance radar building at Toronto; operations building at Fort Nelson; radio aid buildings at Whitehorse; a maintenance garage at Kamloops; instrument landing system comprising various radio buildings at Port Hardy, B.C.; and a VOR/TACAN building at Princeton, B.C.

Other Projects—The effect of corrosion on underground installations was investigated and cathodic protection systems were specified for the underground heating mains and fuel storage tanks at Fredericton, Montreal, Toronto, and Lakehead.

Technical discussions were held with officials of the Corporation of the Township of Richmond, B.C., on the extension of the water supply system, and with the Greater Vancouver Sewerage and Drainage District on the sewage disposal facilities for servicing the new terminal area at Vancouver International Airport.

Arrangements were completed with Toronto Township and Metropolitan Toronto to accept sanitary sewage and domestic waste from Toronto International Airport for treatment and disposal.

At St. John's, Moncton and Windsor, elevated water tanks were heated to limit freezing.

At various sites, including Fredericton, Mill Village (N.S.), Hopedale (Lab.), Fort Chimo, Baker Lake, Prince Rupert and Port Hardy, water supply systems and associated sewage treatment and disposal facilities were investigated. Systems were provided or extended at Gander, Montreal, Toronto, London, Lakehead, Winnipeg, The Pas, Victoria, Kamloops, Edmonton, Watson Lake, and numerous Telecommunications sites.

Operations—The airports at Pitt Meadows and St. Andrews were taken over by the Department during the year.

At Frobisher Bay, flying activity is now at a low level. The U.S.A.F. Strategic Air Command Base was closed down and the building and structures erected by the U.S.A. were turned over to the Department, some facilities of which were transferred to the Department of Public Works. Departmental facilities in "West 40" were moved into the Federal Building, where single accommodation and messing, office space, vehicle storage and maintenance for DOT and other Government departments are now provided. As a result of the departure of the USAF and of consolidation, the Civil Aviation establishment has been reduced.

At Resolute, N.W.T., the aerodrome was transferred from the Department of National Defence to the Department of Transport on March 31. This aerodrome is to be operated by a contractor under the control and direction of a departmental airport manager.

The responsibility for the operation and control of the airport at Fort Churchill has also been transferred to the Department from the Department of National Defence with an effective date of April 1.

Plans are under way for taking over the complete operation of Torbay Airport from the Department of National Defence, and also of the airport emergency services at Saskatoon Airport.

Equipment and Maintenance—The addition of airports taken over from National Defence during the year, the commissioning of new terminal facilities and the expansion of aircraft operational surfaces at existing departmental airports, have all contributed to an increase in all phases of airfield maintenance commitments.

Ninety-six major pieces of equipment were purchased to replace worn or obsolete types and to handle the increased maintenance requirements.

Experience with less costly but more effective high-powered conventional trucks continues to prove their suitability for high-speed snow removal at major airports, and five more units were put into service. With the opening of new air terminals, pavement cleaning equipment was increased by five new pick-up sweepers. As well, five more 15-foot grass mowers were put into service to cope with the increased grass areas at International and trunk airports.

Tests of the prototype crash-fire truck were complete and these new, high-performance, emergency vehicles are expected to be in service shortly. Specification and design studies were also carried out for a new 2,000-gallon water-nurse truck, and it is expected that this equipment will be obtained during the next year.

The program of weed and pest control has increased in all Regions. This work, initiated by the Department, is carried out in conjunction with the National Weed Committee of the Canadian Department of Agriculture.

During the past winter, the National Research Council conducted a symposium on snow removal and ice control. This was attended by engineers from various governments and industry, including some from other countries. Two papers were presented by officers of the Department describing departmental methods and equipment used to combat snow and ice conditions on Canadian airports.

Fire Losses—Fire losses totalled \$117,728, well below last year's total of \$539,234. A total of 1,578 emergency calls were handled by the airport fire services.

Revenue—Revenue totalled \$17,128,033 which included \$8,305,947 in landing fees, \$3,466,636 rentals, and \$4,427,042 concessions, compared with

\$7,529,563, \$2,898,976, and \$3,704,532, respectively, for last year. An increase of \$776,384 in landing fees is attributed to increased traffic and the fact that Vancouver International Airport came under departmental control in June 1962 and figures for 1962-63 were, therefore, for 10 months only. An increase in rentals of \$567,660 results from a number of factors, including the opening of new terminals at Edmonton, Winnipeg and Toronto International Airports during the latter part of the year and increased concession and rental rates at other airports.

Capital Assistance—Additional grants totalling \$100,914.00 for two local airports and one remote airport were made to the County of Restigouche, N.B., the Village of Campbell River, B.C., and the Community Council of North West River, Nfld., respectively and to the Town of St. Anthony, Nfld., for a new remote airport.

Of fourteen applications received for assistance, six were local airports on a cost-sharing basis and eight were for grants-in-aid for remote airport development. Of these, no local airport proposals were approved, primarily because either the sites were not acceptable, economic need was insufficient, or the local interests did not accept the obligations to be met where assistance might otherwise have been warranted. Five of the applications for remote airport assistance were approved, with work planned for 1964-65. A sixth is being considered, approval for which is subject to site survey and cost studies yet to be completed.

Operating Subsidies—Operating subsidies were approved for payment at the following airports: Trenton, N.S.; Saint John, N.B.; Rivière du Loup, Forestville and Rouyn, P.Q.; Brandon, Dauphin, Flin Flon and Lynn Lake, Man.; Beaverlodge and Prince Albert, Sask.; Medicine Hat and Peace River, Alta.; and Castlegar, Campbell River, and Kelowna, B.C.

Lighting and Power—Facilities for visual aids to aircraft were provided at 21 sites, and road and car park lighting was installed at Halifax, North Bay, Sault Ste. Marie, Winnipeg and Penticton.

Further work was carried out on the design, development and evaluation of flush runway-lighting, rotating beacons and wind socks, and design and specification requirements for indoor regulator equipment and for visual approach slope indicator systems were completed.

Of eleven air terminal buildings being provided with electrical power services, six were completed and placed in operation, and the remaining five are in various stages of planning and construction. Two major power distribution systems, involving several miles of overhead and underground circuits, were completed and work started on five more similar systems.

Electrical power services to 16 buildings and other facilities were installed and work proceeded on an additional 27. Fourteen other projects, including power line relocations, power switchgear replacements and diesel generator unit modifications were undertaken, five of which were completed.

Air Traffic Control

Aircraft movements controlled by the Department's 31 airport traffic control towers totalled 2,251,561. Of this, 48.6% were local, civil; 7.1% itinerant, military; 13.7% air carrier; 7.1% local, military; and 4% simulated approaches, civil and military.

The eight area control centres handled 691,808 IFR (Instrument Flight Rules) flight plans and 196,573 VFR (Visual Flight Rules) flight plans.

Northern area control service, provided by the Edmonton, Winnipeg and Goose Area Control Centres for aircraft flying above 23,000 feet, was inaugurated on September 26, 1963. This new service, which is available throughout more than 3,000,000 square miles of Northern Canada, provides air traffic control service for the jet aircraft regularly flying in the area.

Air traffic control evaluation projects included Secondary Surveillance Radar (SSR), Airport Surface Detection Radar (ASDE), and the use of radar display in control towers.

Airmen Licences

At the end of the fiscal year there were 24,350 airmen licences in force classified as follows: pilots—glider, 686, private, 16,085, commercial, 2,552, senior commercial, 379, and airline transport, 1,399; air navigators, 92; air traffic controllers, 819; flight engineers, 36; and aircraft maintenance engineers, 2,302.

Although the total of all licences issued during the fiscal year is only slightly higher than for the previous year, the total personnel licences in force is 4.8% higher than for the period ending March 31, 1963. The total number issued in 1963-64 was, 3,549 and for 1962-63, 3,532.

Of the 2,753 pilots who obtained private pilot licences, 1,194 or 43.4% were trained under the scheme of assistance sponsored by the Department. Thirty-five flying clubs and 91 flying schools participated in this training program.

Aircraft Licences

Civil aircraft registered at the end of the fiscal year showed an increase of 293. Of the 6,563 registered, 1,984 were commercial, 4,389 were private, and 190 were State, compared with 1,978, 4,109 and 183 respectively the previous year.

Air Carriers

At March 31, there were 671 commercial air carriers operating the various types of commercial air services in Canada, of which 410 were Canadian and 261 were Foreign and Commonwealth.

Air Regulations Infractions

Infractions of the *Air Regulations* and *Air Navigation Orders* resulted in 88 prosecutions, compared with 69 the previous year.

Aircraft Accidents

During the calendar year 1963, there were 260 accidents, exclusive of minor ones, involving Canadian registered aircraft, with 211 fatalities, compared with 281 accidents with 104 fatalities the previous year.

The increase in fatalities in 1963 was caused primarily by one accident on a scheduled air service in which 118 were killed.

Flight Services

The Department's fleet of 39 fixed-wing aircraft consists of a Lockheed JetStar, two Vickers Viscounts, nine Douglas DC3's, one deHavilland Heron, 15 Beechcraft 18's, five Piper Apaches, one Piper Aztec and five deHavilland Beavers. These are based at Ottawa Headquarters and at the six Air Services Regions. In addition, there are 20 helicopters which are used for training and on board Canadian Coast Guard ships serving in the St. Lawrence River, on the East and West Coasts, and in the Arctic. Two of the helicopters are operated on behalf of the Department of Mines and Technical Surveys, based on the Hydrographic Survey ship *Baffin* operating on the East Coast, the Eastern Arctic and the Caribbean area.

One helicopter was used extensively for oil pollution patrol in the St. Lawrence from Quebec City to Cornwall, Ont., during the summer shipping season.

The aircraft maintenance and overhaul base carried out 46 engine changes, four overhauls of fixed wing aircraft, and eleven overhauls on helicopters in addition to normal maintenance requirements for aircraft operating from Ottawa.

Aeronautical Engineering and Aircraft Inspection

Three aircraft type approvals and 29 supplemental were issued, and ten approvals were revised to cover changes in aircraft configuration. The first turbo-prop engine designed in Canada received type approval. Two models of aircraft floats designed and constructed in Canada received type approval.

Work continued in connection with the certification of one rotary wing, one twin engine turboprop, and one single turboprop aircraft.

A continued increase is shown in the construction of ultra-light aircraft with 30 registered during the year and 439 reported under construction.

Aircraft maintenance engineer examinations totalled 564, compared with 604 last year.

Notice to Aircraft Maintenance Engineers was revised to give the industry better coverage and is now known as *Notice to Aircraft Maintenance Engineers and Aircraft Owners*. A total of 24 notices were issued during the year.

Three company approvals were granted, bringing the total to 53, and 31 were revised to approve expanded activities.

Radio and Television

Radio station licences issued during the year totalled 104,775, an increase of 6,290 over the previous year. This number includes stations operated by federal, provincial and municipal government departments, stations on ships and on aircraft registered in Canada, and mobile stations operating in the public and private land mobile services, but does not include private commercial broadcasting licences.

General radio service licences issued totalled 10,819 compared with 13,579 issued last year, the first year such licences were in effect.

Broadcasting—Applications for licences to establish amplitude and frequency modulated private commercial broadcasting stations (sound) and for changes of facilities in existing stations totalled 140. Seventy-four applications were received

for licences to establish private commercial broadcasting stations (television) and for changes of facilities in existing stations. There were 122 applications for land stations performing a commercial broadcasting receiving service, 119 for stations performing an auxiliary service to broadcasting, and 150 for transfers of stock, change in ownership or change in the name of licensee.

Notifications concerning amplitude modulated sound broadcasting stations distributed to signatory countries of the North American Regional Broadcasting Agreement totalled 104, and 1,347 received from such countries were examined to ensure adequate protection for Canadian stations in accordance with engineering standards of the Agreement.

Of 71 notifications forwarded to the Federal Communications Commission concerning new stations, changes in existing facilities, deletion of assignment and assignment of call letters, 16 pertained to television broadcasting stations, and 55 to frequency modulated broadcasting stations.

During the year, 53 private commercial broadcasting stations (sound and television) commenced operation, and 30 applications for unattended operation of broadcasting stations using supervisory control systems were received and approved. Six multiplex FM stereophonic broadcasting systems came into operation and other FM stations are now including this system in their plan.

Information provided for the use of the Board of Broadcast Governors consisted of coverage maps, population statistics, and technical information for new private commercial broadcasting station licences and applications for changes in existing station facilities.

Equipment and Frequency Spectrum Standards

In the first complete year of type-approval testing for fee, 38 units were tested, totalling \$11,340 in fees.

In the Radio Regulations Engineering Laboratory, 55 equipments were tested for approval and enforcement purposes, and several field projects in measurement of spurious emissions from radar installations were conducted. Experiments are in progress to develop a method of measuring occupied bandwidth of emissions in actual traffic, and additional equipment was acquired which will provide the Laboratory with complete environmental testing facilities.

Under the recent Canada-United States co-ordination agreement, 125 U.S. sites, involving 285 types of radars, were co-ordinated with microwave and other radar systems. Co-ordination and compatibility studies for the Department's communication satellite ground terminal in Nova Scotia were completed and the site location has been confirmed.

A U.S. Coast Guard proposal to construct a Loran "C" station in Newfoundland in co-operation with the Department was investigated for interference aspects, and test programs were conducted at Loran "C" installations at Sylt, Germany and Wildwood, U.S.A., to assess interference problems with the Decca Navigator system.

Safety Radio Surveys, Inspections and Suppression of Interference

Radio Regulations Inspectors, operating from 30 field offices throughout Canada, conducted 1,547 ship station radio surveys and 15,979 inspections of stations of various classes to ensure compliance with Canadian laws and international conventions and treaties.

Interference complaints received totalled 27,650 and 27,134 were completed.

Close liaison continued with manufacturers and distributors of aviation and marine radio equipment, and also with organizations engaged in the use, installation, repair and overhaul of such equipment, to promote effective application of acceptable practices in keeping with specifications and standards set by the Department.

Radio Interference Service

Methods and techniques were developed for assessing loudness of commercials on both TV and radio broadcasts. Loudness limits were established, and volume level indicators for this purpose were built and distributed to each Region.

Power lines examined for interference problems included one in Saskatchewan, and plans for proposed lines of Extra High Voltage (EHV) (500 to 700 KV) for the provinces of Ontario and Quebec.

Several manufacturers were given advice on the suppression of interference from their street lighting systems.

Two plans for prototype investigation and interference vehicles were drawn up.

Examinations and Certificates of Proficiency in Radio

During the year, 5,439 radio operator examinations were conducted, compared with 7,269 the previous year, and 5,030 certificates of proficiency were issued compared with 7,643 in the previous year.

Radio and Radar Aids to Navigation

During the year, marine communications projects completed included transmitter and receiver sites at St. John's, Nfld., and Mont Joli, Que.; rehabilitation of the marine station at Cartwright, Nfld.; VHF installation and remote receiver site at Montreal; relocation of marine stations at North Sydney, N.S., and Sault Ste. Marie, Ont.; and a transmitter site at Kingston, Ont.

A program is under way to provide single side-band capacity at marine coast stations, and installations have been made at Halifax and Vancouver on an experimental basis.

Halifax and Vancouver have been set up to undertake Commonwealth HF/CW communications and the scanning system is ready for installation at Halifax.

A specification has been completed for landlines terminating at marine stations for duplex ship-to-shore radiotelephone service.

Ship Installations—VHF/FM radiotelephones have been fitted in sixteen departmental vessels, and radiotelephones for operation from storage batteries have been provided for Northern supply vessels and several of the larger departmental vessels for back-up and emergency operation.

A VHF/FM communication network for the St. Lawrence Ship Channel Service was planned and the equipment fitted in five barges, one base station and one vehicle.

VHF/FM portables and MF transistorized radiotelephones have been procured for ships, launches and landing barges to facilitate landing operations, and VHF/AM equipment is being provided for the CCGS *Cornwallis* for communication with a recently acquired helicopter.

The Gander long-range VHF aeronautical communications system located at Torbay for the extension of the Gander Area Control Centre coverage over the North Atlantic was commissioned in September. Peripheral circuits were completed from the Winnipeg Area Control Centre to Davidson, Clear Lake and Melville.

The mobile control tower was completed in July and has been in service at the Canadian National Exhibition air show in Toronto and the Toronto International Airport, and is now being installed at Penticton airport.

Remote receiver and transmitter sites at Edmonton are now operational and the remote transmitter sites at North Bay and Winnipeg were completed. The transmitter building for the Air Services training installation at Carp Airport was completed and equipped, and communication facilities for air traffic control and aeradio were completed at the Toronto, Winnipeg and Edmonton terminal buildings.

A low-frequency radioteletype circuit between Coral Harbour and Frobisher to tie in with the Churchill-Coral Harbour circuit was completed, and an HF radioteletype circuit between Resolute and Churchill was taken over from the RCAF in March 1964 as part of a plan to establish an ATC Upper Information Region in the Arctic.

At Mont Joli, an extended range installation will be completed early in 1964 for the extension of Moncton Area Control Centre coverage over the north of the St. Lawrence River.

A second frequency for ICAO on the Gander long-range communication system located at Torbay will be completed in the summer of 1964.

During the coming summer, an extended range VHF installation will be completed at Knob Lake, as well as a peripheral circuit from Goose Area Control Centre. At Alert and Resolute, VHF installations to provide air/ground communications in the Upper Information Region will also be completed.

Combined aeronautical-marine radiobeacons were established at Eskimo Point and Rankin Inlet, N.W.T., and the marine beacon at Pointe des Monts, P.Q., was converted to combined aeronautical-marine service.

Marine radiobeacons were established at Cape St. Francis, Nfld., Cranberry Island, N.S., Bird Rock, P.Q., Parry Sound, Ont., and Bonilla Island, Cape Scott, Estevan and Pine Island, B.C.

Aeronautical radiobeacons were completed at Yarmouth, N.S., Charlottetown, P.E.I., Moncton, Fredericton and Forest City, N.B., Blanc Sablon, P.Q., Moosonee, Ont., Jumping Pound, Alta., and Victoria and White Rock, B.C.

At Baker Lake, N.W.T., a high-power radiobeacon was commissioned to provide greater coverage in that part of the North.

The Cabot Strait Decca Chain installations were completed and commissioned, replacing the West Newfoundland Decca Chain.

VOR/TACAN—The first doppler VOR (Very High Frequency Omni Range) installation in Canada was completed at Port Hardy, and the preliminary flight check showed considerable improvement over the standard equipment in coping with terrain interference problems at this site.

VOR construction work is well under way at Princeton and Kimberley VOR mountaintop sites, and Enderby was completed.

The re-location of the Ottawa and Windsor VOR's is well advanced and should be completed early in the coming fiscal year.

Construction of new VOR facilities at St. John's, Nfld., Quebec and Sudbury, is under way and the Kleinburg VOR, north of Toronto, has been completed.

Preparations for the TACAN (Tactical Air Navigation) equipment installations are well advanced. Eight cones have been installed and five VOR antennas changed. A contract was awarded for the installation of the dual equipment at 22 stations, and a further seven VOR stations are being modified.

Instrument Landing Systems—Two new Instrument Landing Systems were commissioned at Toronto, localizer relocations were carried out at Saint John, N.B., and Calgary, and a new localizer was commissioned at Gander replacing one that was demolished by an aircraft.

Glide paths were commissioned at Moncton and Fort St. John, and new glide path equipment was commissioned at Winnipeg, Saskatoon, Lethbridge and Calgary.

An OM/NDB was commissioned at Prince George, BBM/NDBS were commissioned at Saint John, N.B., Saskatoon and Edmonton, and successful operation of a M-Array glide path was demonstrated at Abbotsford, B.C.

Radar—At London, Ont., the installation of surveillance radar type AASR-1 was completed and a radar data transmission system was installed for commissioning in June 1964.

At Carp Airport, Ont., a Precision Approach Radar (PAR) system and a C-band weather surveillance radar were installed for training purposes.

Airport surveillance radars type ASR-3 are being installed at Toronto, Montreal and Vancouver, and will be operating before the end of 1964.

A contract was let for supplying 19 secondary surveillance radar systems for installation at major airports across Canada, scheduled for completion during 1965-66.

Seven radar to television scan conversion systems were delivered and installations in the Winnipeg and Edmonton Air Traffic Control Centres were completed.

Twenty-four radars, twenty-one echo sounders and 18 gyro compasses were installed in departmental vessels.

An additional Gander-New York teletypewriter circuit was commissioned. This circuit was necessitated by heavy increased traffic flow resulting from Canadian responsibility for New York-London traffic coincident with commissioning of the ICAO North Atlantic cable.

Preliminary planning for installation of automatic teletypewriter message switching systems was completed and arrangements made for the first of these systems to be placed in operation at Vancouver in July 1964.

Following successful completion of tests on the use of telex at coast stations, telex has been commissioned at some 30 coast stations during the year.

As the result of a review of existing radio navigational aids during the year, five LF radio ranges were downgraded to non-directional radiobeacons and three radiobeacons were decommissioned. Air-ground communications at Dafoe and Broadview were withdrawn from service.

Regular flight checking RCAF TACAN installations at Bagotville and Val d'Or, P.Q., and Ottawa and North Bay, Ont., was undertaken by the Department, and a special commissioning flight check was carried out at Moose Jaw at the request of the RCAF.

Halifax (VCS) marine radio station took over long distance radio-telegraph service from Halifax radio (CFH) and replaced it as the area receiving station for Area 9 in the Commonwealth scheme.

Research and Development

Approval was granted for the expenditure of approximately \$6,000,000 for the establishment of a ground read-out station in Nova Scotia, as Canada's contribution to the Communications Satellite Program. Contracts have been awarded for manufacturing the steerable antenna, antenna radome, antenna pedestal and antenna feed system. It is expected that the station will be completed by the end of October 1965.

Studies under way include the use of unattended facilities at isolated sites; determining the type of equipment best suited to detecting and monitoring the movement of aircraft and vehicles on airports; minimizing interference to departmental radars during military exercises; and developing a device that will warn of the existence of underwater obstacles lying ahead of departmental northern supply ships operating in uncharted waters.

Various systems have been investigated to find an economical and otherwise suitable means for the transmission of radar intelligence from one air traffic control centre to another. To meet an immediate requirement for transmitting radar data from the surveillance radar at Lambeth, Ont., to the Toronto air traffic control centre, one radar data transmission system has been purchased for immediate installation and is scheduled to be operational by June 1, 1964. A radar pattern generator which will be suitable for use in the field has been developed and built in the department's research and development laboratory. This device will be used in testing the data transmission systems.

Tests are being carried out to find a cathode ray tube suitable for providing bright radar displays in air traffic control towers, on bridges of ships and for use with meteorological radars.

Common Carrier and Landlines

Negotiations were concluded with Canadian National Telecommunications regarding expansion of their network northward to Inuvik. The Polevault system scatter station at Frobisher, N.W.T., was acquired from the USAF and arrangements made with CNT for its continued operation on a commercial basis.

Air traffic control interphone network service was extended to Churchill, Williams Lake, Quesnel and Prince George, and a new express circuit was established between Toronto and Montreal. Push button equipment for termination of communication circuits was provided at Prince George control tower and orders were placed for similar equipment for Victoria and Fort St. John control towers.

Direct controller-to-pilot facilities in the Winnipeg area were re-arranged and orders were placed for new service between Moncton-Mont Joli, and Goose Bay-Knob Lake.

Weatherfax service was extended to Windsor and orders were placed for provision of a START-STOP feature on the supplementary weatherfax network. Weather teleprinter service was extended to Moosonee and Uranium City, and orders were placed for sequential data collection features on 11 circuits.

Approximately 465 applications for additions or revisions to leased private line services and about 200 applications or revisions to public telephone service were processed.

CENTREX service was established at Toronto International Airport and an order was placed for similar service at Montreal International Airport. Winnipeg and Edmonton International Airports were provided with direct-in-dial switchboards.

Meteorological Services

Observing—A surface observing network comprising 282 stations provides synoptic and/or hourly weather observations by teletype, radio, telegraph or telephone. Of these, 163 provide hourly reports daily throughout the twenty-four hours and 35 take pilot balloon observations. Additional stations provide supplementary reports for special purposes such as forest fire protection, public weather forecasts and marine forecasts.

At the end of the fiscal year, there were 107 merchant and other vessels making marine observations under the supervision of the Meteorological Branch. During 1963, these ships made approximately 30,824 observations, an increase of 3,225 over the previous year.

In addition to the permanent reporting ships, 121 ships were recruited on a trip-to-trip basis as auxiliary reporters to provide greater coverage of reports on the Pacific.

At 32 upper air stations, including the Pacific weather ships, a program of upper air observations was maintained. These observations are taken twice daily at 12-hour intervals and provide aerological data essential in the preparation of weather forecasts for aviation, military and civilian requirements.

At Coppermine, Frobisher and Port Hardy upper air stations, seismological observations were taken for the Department of Mines and Technical Surveys.

Upper Air Instruments—The present rawinsonde ground receiving equipment is being replaced by the latest type of instruments, operating at a frequency of 1680 megacycles. Since the new equipment is much more precise and, therefore, cannot tolerate any obstructions above the natural horizon, several stations must be resited or altered. Preliminary work has already begun on resiting at such locations as Edmonton, Moosonee, Frobisher and Goose.

To find a better method of generating hydrogen, a new generator has been developed that will produce the gas by electrolysis of water at a much lower cost than the old method of chemical reaction between caustic soda and aluminum. A prototype model was in operation for several weeks at the upper air training school in Scarborough and, although its operation was reasonably successful, further modifications are being added to make the unit adaptable for isolated locations.

Arctic Weather Stations

The basic meteorological program at these stations consisted of eight synoptic weather observations, two upper wind observations using pilot balloons, and two upper air ascents per day. At Alert, Eureka, Isachsen and Mould Bay, the program was increased by hourly and special surface observations during the periods of unusually heavy flying activity, such as during the resupply airlift and when

scientific expeditions were operating in the vicinity during the summer months. At Resolute, hourly and special surface weather observations were carried out on a year-round basis.

Scientific projects at these stations included measurement of tides, sea ice thickness, observations of snow temperature gradient and the physical characteristics of snow both surface and profile.

Airstrip improvement at the four satellite stations has been developed sufficiently for regular use during the fall and spring air resupply, and for landings of light aircraft and occasional heavy aircraft during the summer months, except at times of heavy thaw or rain.

Eureka weather station rehabilitation was completed, and the upper air facility at Resolute was relocated so that observations can be made at much higher levels.

Forecasting

The forecasting system has three basic levels of operation, each dependent upon the one above it. At the Central Analysis Office (CAO) in Montreal, the broad scale hemispheric features of weather patterns are charted. Assisted by a high speed computer, the CAO derives the forecast patterns for the longest time ranges in the future. At the next level the Weather Centrals, operating within the large scale flow patterns provided by CAO, undertake the more detailed analysis and derive the forecast parameters for the future in the medium time ranges. Finally, a larger number of Weather Offices, operating within the guidance provided by the supporting Weather Central, deal with the shortest range forecast, and are responsible for the actual preparation and dissemination of the weather forecasts to all users, both civil and military.

Based on the success of this reorganization carried out in the Maritimes in 1962-63, similar changes were introduced in British Columbia during this fiscal year.

At the Central Analysis Office, development work on extended forecast methods continued. Procedures were decided upon for the routine issue, beginning in June 1964, of third-day temperature and precipitation forecasts for Canada. During the year, a routine numerical weather prediction program, using a high speed electronic computer, became operational. The program will be extended during the coming year.

Aviation Weather Forecasts

Weather forecasts for aviation were prepared several times a day for aerodromes and aviation regions covering most of Canada. Designed for short and medium range aircraft, both civil and military, these forecasts were distributed to users not only throughout Canada but also to the United States as required.

For long-range and high altitude flights over Canada, including the Arctic, area forecasts prepared at the new high level forecast centre in Montreal, inaugurated in June 1963, were issued in chart form and distributed by facsimile. Area forecasts in chart form were exchanged with the United States to cover routes to Europe, Asia, Honolulu, Central America, the Caribbean and the United States.

Aerodrome forecasts were prepared for international aerodromes and distributed to Europe, Asia, Central America and the Caribbean.

Public Forecasts

Weather forecasts for periods up to 48 hours were issued for all the populated areas of Canada and were provided to the general public through normal news facilities. Marine area forecasts were issued for coastal waters and inland waterways, in some areas on a seasonal basis, and were distributed to shipping interests through the Department's marine radio stations.

These several forecasts were supplemented by special forecasts in the interest of agriculture, forestry, industry and government. These included frost warnings for fruit growers in the Okanagan, Niagara and Annapolis areas, for tobacco growers in southern Ontario, and special advice for agriculturists in southern Ontario and the Maritimes during harvesting operations. Throughout the growing season, Alberta farmers were provided with agricultural weather bulletins through the co-operation of the Edmonton Forecast Office and the Alberta Department of Agriculture.

Warnings were issued whenever hazardous weather conditions, such as freezing rain, heavy snow or rain, blizzards, gales and severe cold were expected to endanger life and property, and marine warnings were issued for coastal waters when dangerously high winds were expected. Warnings covering weather of special concern were relayed direct to conservation and civil authorities, public utilities and transportation interests, and were also widely distributed through the press, radio and television.

Communications

The meteorological teletype system was increased from 55,300 to 55,800 miles of circuit, serving 355 stations with 531 connections. The weatherfax system operated to 80 stations equipped with 97 connections over 14,500 miles of facsimile network.

Ice Reconnaissance and Observing

Aerial ice reconnaissance to aid marine transport and associated projects was carried out in every month of the year in one or more areas. These areas included the Eastern Seaboard, Arctic and sub-arctic areas, the Great Lakes, Lake Athabasca, and Great Slave Lake.

During the year, 16 ice observers flew a total of 3,080 hours. Of this, 2,464 hours were flown by chartered aircraft.

Over the Eastern Seaboard, ice observing was carried out from field units at Gander, Nfld., Sydney, N.S., and Mont Joli, P.Q. All aircraft in this operation were equipped with airborne radar to supplement visual observing techniques and to provide limited observations during periods unfavourable for visual observation. The aircraft were also equipped with Decca navigation equipment to ensure precise information on the location of ice. One aircraft was equipped with doppler navigation equipment to determine its usefulness in providing precise navigation in areas where Decca navigation facilities are unavailable.

Ice observers also participated in *Bold Survey*, a joint U.S.-Canadian project to make infra-red and conventional photograph measurements of ice conditions.



Toronto International Airport Aeroquay

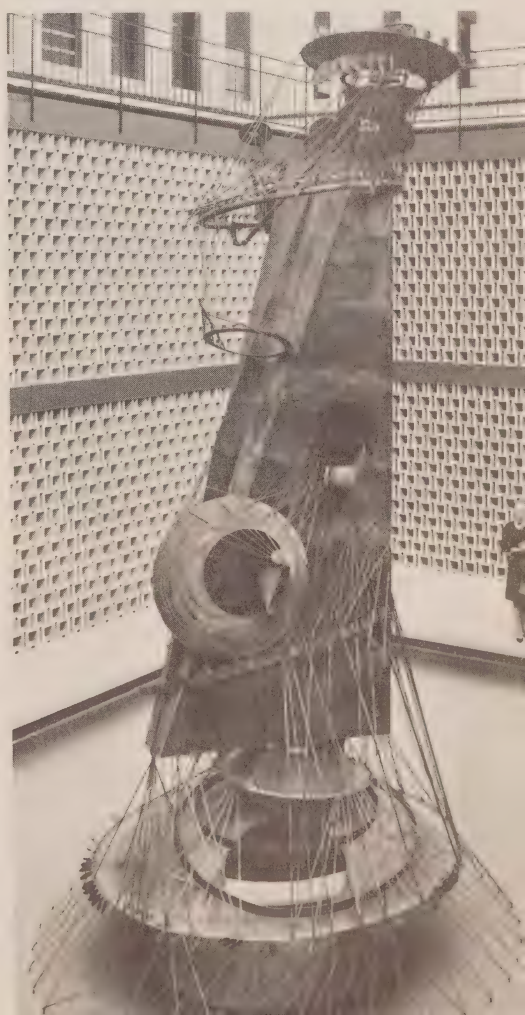


Welded bronze sculpture by Gerald Gladstone—
Winnipeg International Airport

route markers or "inussuks" in front of the
ment's administration building at Toronto Inter-
n Airport

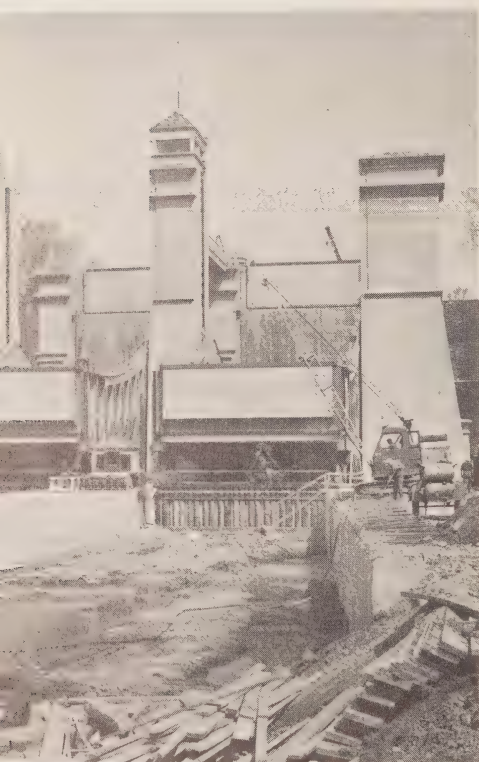


erstorey, 2,400-car parking structure—Toronto
er tional Airport





▲
CCGS *Narwhal*



◀ Trent Canal System—Re-
construction work at the
Peterborough lift lock.

CCGS *Ready*
▼





CCGS *Tembah*

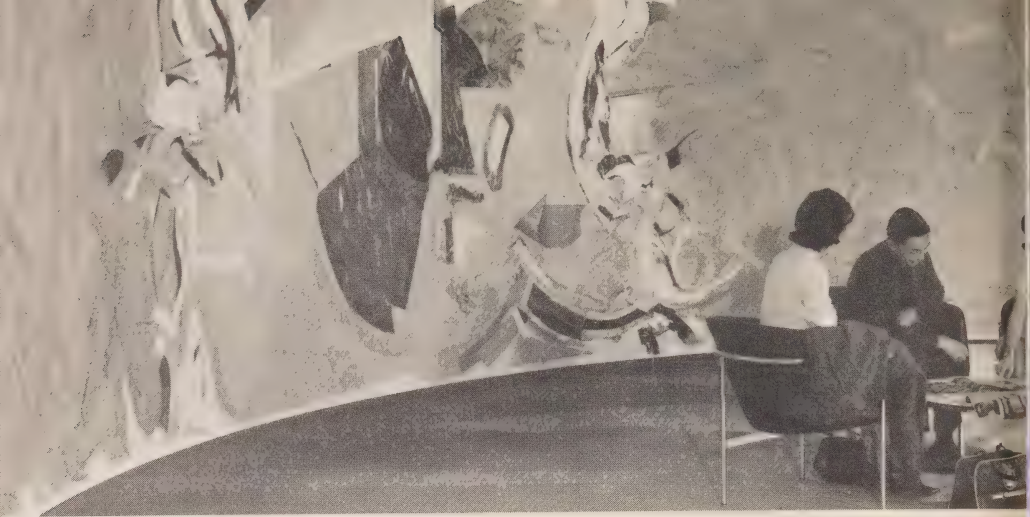
CCGS *Skidegate*



CCGS *Montmagny*

CCGS *Relay*





Mural by Dennis Burton—Edmonton International Airport



Edmonton International Airport—Administration building with air traffic control tower rising over each road



New air terminal building at North Bay, C



Power plant at Edmonton International Air



Climatology

At the end of the fiscal year, there were approximately 1,900 stations in the climatological network. Of these, 1,670 were operated by voluntary observers and the remainder were operated by paid part-time observers.

The recording rain gauge network consisted of 174 stations, with equipment in the field for an additional 30 stations to be installed in the spring of 1964.

In the evaporation network, equipment was installed at eight new stations, bringing the number of stations equipped with class A evaporating pans to a total of 38.

Supplementary networks in operation consisted of 197 stations for the automatic measurement of surface wind, 18 for measuring soil temperature, and 179 for measuring bright sunshine.

Research—Reports were completed on the frequency and persistence of sub-zero minimum temperatures, critical periods of snow melt in the 1963 Liard and Hay River floods, and air temperatures during the 1951-60 decade with emphasis on freezing and thawing indices.

In co-operation with the Ontario Agricultural College, field research was carried out at Guelph on dew fall and evapotranspiration. A mobile laboratory was delivered during the year and several surveys of the temperature variations in southwestern Ontario were carried out in connection with a frost project for locating new fruit-growing areas. This research has been undertaken in collaboration with the Ontario Research Foundation.

Preliminary studies of the variation of temperature and humidity under forests of different densities and species were made at Petawawa in co-operation with the Canadian Department of Forestry in connection with a new forest meteorology project. This project was set up for the study of the forest microclimate conditions with regard to regeneration of forests, and 14 ordinary climatological stations were established on the project site. A final report on the tobacco fleck project, carried out in previous years, was prepared for publication.

Hydrometeorology

A major study of critical meteorological conditions leading to maximum floods on the Saint John River, New Brunswick, was published during the year to aid in the safe and efficient design of major hydro-power dams. Special studies of factors affecting floods on the Duncan River basin of the Columbia River system, and of meteorological aspects of flood flows on Nova Scotia rivers were initiated. In a co-operative research program on possible improvement of water yield by vegetation manipulation in the Eastern Rockies Forest Conservation Board area (Alberta), meteorological instrumentation was completed for assessment of hydro-meteorological factors in the water balance of Marmot Creek research basin. A second basin in the Aspen grassland vegetation area has been selected for future study.

Other special investigations completed during the year include a study of large scale atmospheric circulations leading to floods on the Fraser River, B.C., a study of the relationship between precipitation and air mass water vapour content on the Canadian prairies, and methods of adjusting rainfall intensity data for changes in elevations in the mountainous areas of British Columbia.

Plans were developed for Meteorological Branch participation in the International Hydrologic Decade, 1965-74, and these were co-ordinated with those of other federal agencies concerned with hydrologic research.

Great Lakes investigations were concentrated on data collection programs by the research ship CCGS *Porte Dauphine*, and at the site of the nuclear reactor at Douglas Point on Lake Huron, and on studies of these data. Observations from the *Porte Dauphine* were used, along with water intake temperature data at installations around Lake Ontario, to make the first reliable estimates of variations in monthly and yearly evaporation losses from Lake Ontario. Four papers were published on the Douglas Point project, dealing mainly with the influence of Lake Huron on temperature and wind conditions near the reactor site. A major study of meteorological factors affecting ice cover on the Great Lakes was completed, and the results provided a reliable method for predicting percentage ice cover on each of the lakes.

The international Lake Erie Study Group's activities were extended during the year to include all of the lakes and the name was changed to the Great Lakes Study Group.

Rainfall-intensity-duration-frequency maps for Ontario, for durations of three to 72 hours, were published at the request of the Ontario Department of Highways for use in designing drainage facilities such as culverts and small bridges. Rainfall-intensity-duration frequency curves for rainfalls of durations less than three hours were prepared for 18 major centres in Canada to aid in designing storm sewer systems in drainage facilities.

Precipitation Physics Project—The purpose of this project is to discover the basic causes of precipitation and other related information. Started in 1959, the field phase was completed in 1963, and the data collected is now being studied.

Alberta Hail Project—The Meteorological Branch continued its assistance in this project, which is operated by the Stormy Weather Research Group of McGill University and the Alberta Research Council with co-operation from the National Research Council and the RCAF.

Ozone—Ozonesonde observations continued at Churchill and Goose Bay, and experimental work was carried out on several projects in the ozone field. During the past winter, facilities at Resolute were made available to Cambridge University for the purpose of measuring ozone with a stellar ozone spectrophotometer developed at the University.

Radiation—The net radiation network increased to six stations with the addition of a net radiometer at Resolute in the fall of 1963. Equipment for two combined solar and net radiation stations was prepared for installation at Alert and Mould Bay late in 1964.

Grants

During the year, grants to Canadian universities in aid of meteorological research totalled \$86,000. Of 17 applications for 1964-65, the Advisory Committee recommended eleven for grants totalling \$87,500.



Prince Shoal light—at the junction of the Saguenay and St. Lawrence Rivers

MARINE SERVICES

Aids to Navigation

The project to modernize shore based and floating marine aids continued, with more kerosene-wick lanterns being replaced by automatic electric lights, by addition of lights on bell buoys, and by providing modern aids in the Eastern Arctic. Automatic lights total 2,791, and there are 583 manned lights where sound, radio and light signals require daily attendance.

Other navigation aids include 398 fog signals of various types, two lightships, and more than 14,000 buoys, beacons and markers of all types. The buoys include 1,158 light, 57 sound, and 382 light and sound. Maintained on charted positions throughout the shipping season, the buoys are regularly checked by masters and officers of departmental ships and by inspecting officers from the District Marine Agencies.

In areas where navigation closes for the winter, the buoys are lifted and stored, and, where required, specially designed ice buoys are placed for the benefit of late shipping.

In secondary channels and isolated locations, minor buoys, bushes, stakes and other markers are maintained under contract, some 300 of which were in force during the year. These minor services are checked periodically by Marine Agency inspection officers.

Construction

The new lighthouse at Prince Shoal, P.Q., was completed and will go into operation on April 1, 1964.

Thirty-four new dwelling units, 12 fog alarm buildings, and six major lighthouse towers were constructed by contract under the supervision of departmental engineers to replace obsolete lightstation structures or to provide additional dwelling accommodation.

At Charlottetown and Dartmouth, new Agency wharves were 95 per cent completed, and at St. John's, Nfld., the construction of the new Agency administration, stores and shops building was 90 per cent completed. The design of the new Agency administration, stores and shops buildings at Prince Rupert, B.C., is under way, with construction expected to start in the fall of 1964.

Preliminary architectural design for the new Charlottetown Agency Depot administration and stores building is under way.

Studies have been undertaken to develop a combined Transport-Mines and Technical Surveys establishment in British Columbia.

In addition to these major projects, a number of new minor lighthouse towers were constructed and the regular repair program was continued.

Electrical and Mechanical Equipment

Electrification of lightstations continued, with diesel-generated power being installed where commercial power is not available. Improved types of light, particularly acrylic lens types, are being purchased for replacements. The use of mercury vapour lights is now considered a success, and trials of various sized lamps in various optics are being carried out at the Prescott Marine Depot.

The Prince Shoal, P.Q., lightstation was completely electrified. The normal light is incandescent with an intensity of nearly half a million candlepower. During fog, an Xenon light is available with an intensity of 32 million candlepower.

Pelee Passage light in Lake Erie is now operating by radio remote control from Southeast Shoal on a trial basis.

The results of tests carried out with a thermoelectric generator showed this means of supplying power for lights too inefficient and complicated to compete with present methods. Fuel cells seem to have possibilities for this purpose, but are not yet available for testing.

New fog alarm stations were established at Portugal Cove and Baccalhao in Newfoundland, and at Sambro and Peter Islands in Nova Scotia.

The Prince Rupert Agency was supplied with a number of machine tools to facilitate ship and equipment repairs, and the St. John's Agency has been similarly equipped. Other machine tools have been provided where necessary for use at the Quebec and Victoria Agencies. In Newfoundland, engine-driven hoists have been provided for boat haul-up.

A number of new sound signals were tested, and an electronically-operated sound emitter installed at the Porlier Pass lightstation in British Columbia has shown satisfactory results. Tests of a Canadian manufactured air horn resulted in acquiring two for installation.

Publications

The annual edition of *Notices to Mariners* was expanded and 4,600 copies were distributed. The examinations for masters and mates now include a section on these *Notices* and the annual edition is, therefore, required reading for candidates for Certificates of Competency.

St. Lawrence Ship Channel

During the open water season of 1963, basic hydraulic data were collected for the first time in the uppermost tidal reach between Lanoraie and Trois Rivières.

Round-the-clock measurements to determine tidal characteristics were taken on the Lake St. Peter outlet and inlet areas, and supplemental measurements were taken in the Montreal-Sorel reach, with some concentrated work done in the World's Fair area.

Hydraulic model testing continued throughout the year, with a lengthy test series carried out on the effects of Ship Channel widening, as well as several proposed compensatory works. Other tests were made on such works as the World's Fair site and the Boucherville bridge-tunnel project.

The regular fleet of five survey and inspection vessels was engaged throughout the navigation season on channel maintenance and improvement in the St. Lawrence River, and two maintenance units worked in the St. Lawrence Seaway.

Construction—Of a three-year contract for 800-foot widening between Trois Rivières and Cap Charles, from Trois Rivières to Cap de la Madeleine was completed in 1962, Cap a la Roche Curve was 90 per cent completed, and Cap Charles Channel and Curve was 87 per cent completed.

Work carried out for the National Harbours Board included maintenance surveys and sweeping in Montreal Harbour, at all the berths in Trois Rivières Harbour, and in the St. Charles River and Wolfe's Cove in Quebec Harbour.

Canals

The new Carillon Canal opened to navigation on May 3, 1963. Pleasure boat traffic on the other canals continued to rise, with the Rideau and Trent Canals showing substantial increases over last year. Lockages through the Trent totalled 99,488 compared with 91,725 the previous year, and through the Rideau, 49,234 compared with 43,223. Freight traffic through the Canso Canal totalled 1,206,582 tons, compared with 1,093,539 in 1962.

Construction and Engineering—The general program of modernizing the Trent Canal system continued, and on July 27, 1963, the new Fenelon Falls lock was officially opened. Detailed engineering work, including field surveys and tender drawings, for a new lock at Swift Rapids was completed.

New underground cables and floodlights were installed at all eight locks at the Ottawa lockstation.

Harbours and Property

Public Harbours—During the year the port of Cobourg, Ontario, was proclaimed a public harbour. There are now 312 such public harbours, of which 116 are under the supervision of harbour masters appointed by the Minister.

Harbour dues collected totalled \$402,480, an increase of 51.9 per cent over the previous year.

Wharves—Of some 3,000 wharves, piers and breakwaters under the administration of the Department, 479 are in charge of wharfingers. Revenue from wharf properties amounted to \$1,218,209, an increase of \$185,204 over the previous year.

Water Lots—During the year there were 2,075 water-lot leases in effect, yielding a revenue of \$285,569.

Steamship Inspection

Ship inspections carried out included 195 new ships completed in Canada, 20 converted or reconditioned, three built outside Canada for Canadian registry, and 26 transferred to Canadian registry. In addition, 1,898 Canadian registered vessels and 57 registered elsewhere, totalling 2,755,127 gross tons, were inspected. Of the latter, 446 were passenger ships totalling 281,510 gross tons.

Eight accidents and five fatalities in connection with loading and unloading ships were investigated.

Of 3,539 ships tackle inspections made, 236 cases required repairs, adjustments, or testing of cargo handling gear.

Crew accommodation regulations, which concern lighting, ventilation, drainage and standards for the protection of crew, were promulgated.

On June 13 work commenced on the construction of a marine haul-out at Clarendville and proceeded until severe winter conditions in mid-December forced the suspension of operations until the following spring. Although some delay was caused by difficult dredging and rock blasting, about 56 per cent of the contract was completed.

Lifejackets

The manufacture of lifejackets to new specifications issued during the year was authorized, arrangements with the Canadian Government Specifications Board on lifejacket research continued, and a cross-country testing program was initiated.

Water Safety

Recommended safe load and capacity plates—compulsory for certain categories of pleasure boats—issued to individuals during the year totalled 28,342, and 24,516 were issued in bulk quantities to boat manufacturers.

Three hundred and fourteen thousand copies of the booklet, *Safety Afloat*, were distributed, boating safety equipment was displayed at a number of exhibitions, and departmental officers gave public addresses on water safety at various boating functions.

Pollution

Oil Pollution—Patrols were carried out by helicopters in the St. Lawrence River area, and cases of pollution reported by armed services and civilian aircraft, departmental officers and Fisheries officers were investigated. There were ten prosecutions, all of which resulted in convictions.

Air Pollution—Regulations governing smoke emissions from ships were promulgated during the year.

Marine Engineering Examinations and Training

Candidates for certificates of competency as marine engineers totalled 1,103, of which 852 were successful and 168 received partial passes.

Correspondence courses in marine engineering are being completed and made available to trainees and engineers of the Canadian Coast Guard. These courses, when fully developed, will be made available to the Marine Engineering Schools now controlled by the Department of Labour.

Revenue

Revenue collected, including inspections services and examination fees, totalled \$242,732.

Pilotage

There were 360 licensed pilots engaged in pilotage in the ten districts for which the Minister is the pilotage authority. They performed 35,596 pilotages inward or outward and 10,040 movages, grossing \$5,454,702.00 in fees.

Cornwall to Kingston—During the 1963 navigation season, 21 licensed Canadian pilots performed 2,121 pilotages from Cornwall to Kingston.

Port Weller to Sarnia—Under the *Prevailing Rate Regulations*, 34 pilots were employed to conduct ships from Port Weller to Sarnia. Pilotages totalled 2,763.

The Lakehead and St. Mary's River—Three pilots were employed by the Department to conduct ships through the St. Mary's River and into ports on Lakes Huron, Michigan and Superior.

Labrador—Two pilots were employed by the Department to assist ships in and out of Goose Bay.

Ship Registration

Small vessels exempt from registry and licensed under the *Small Vessel Regulations* numbered 53,017, making a total of 521,374 issued throughout Canada to December 31, 1963. During the same period, 1,575 vessels were added to the Canadian registry and 779 removed, making a net increase of 796. At the end of December, there were 22,796 vessels of 2,858,746 gross tons registered in Canada.

The Registrar General of Shipping and Seamen in the United Kingdom was supplied with information on approximately 8,800 separate transactions involving first registry, re-registry, transfer and transmissions of ownership, mortgages and changes in name, together with details of all vessels registered during this period. This information is used in compiling the *Mercantile Navy List and Maritime Directory*, which shows particulars of vessels registered in the Commonwealth.

Revenue from various types of registry transactions totalled \$15,166.00.

Marine Casualties

Seven marine casualty investigations were held under the *Canada Shipping Act*, one of which was a formal inquiry.

Masters, Mates and Seamen

Examinations held for masters, and first and second mates certificates of competency and service totalled 2,951. In addition, 135 separate sight test examinations were held. A total of 383 masters, 65 first mates and 52 second mates were granted certificates, and 610 temporary certificates as master were renewed.

In addition, 92 masters, 20 first mates and four second mates were granted permission to serve for a limited time while holding qualifications inferior to those prescribed by the *Canada Shipping Act*.

A total of 14 seamen received certificates of qualification as ships' cooks and 72 qualified as able seamen.

Examinations were held and certificates of qualification issued for 341 masters and mates for Great Lakes waters.

Examination fees for masters and mates totalled \$13,935.65.

A total of 338 seamen were examined for certificates of efficiency as lifeboatmen, of whom 311 were successful:

Amounts received in connection with the relief, maintenance and repatriation of seamen left behind at ports abroad amounted to \$1,223.40, of which \$450.85 was recovered from shipowners.

Amounts of \$1,312.00 and \$816.00, representing deserting wages and fines respectively, were received and deposited in the Consolidated Revenue Fund of Canada.

During the year there were 38,783 engagements and 36,221 discharges of seamen from ships of British registry at 102 Canadian ports.

Canadian Coast Guard

Ten new ships were added to the fleet during the year: CCGS *Narwhal*, a northern service depot ship; CCGS *Montmagny*, a lighthouse supply and buoy vessel for service with the Sorel Marine Agency; five 95-foot search and rescue cutters—*Rapid* and *Rally* for the East Coast, *Relay* for the Great Lakes, and *Ready* and *Racer* for the West Coast; a 70-foot cutter, *Spume*, also for the Great Lakes; a tender, *Skidegate*, for the Prince Rupert Agency, and shallow draft buoy vessel, *Tembah*, for the Fort Smith Agency.

The fleet now consists of 204 craft of the following types: full icebreakers, 10; light icebreaker, supply and buoy vessels, 8; special Arctic service vessel, 1; Northern supply vessels, 6; Northern service depot ship, 1; lighthouse supply and buoy vessels, 11; Mackenzie River shallow draft buoy vessels, 4; lightships, 3; St. Lawrence Ship Channel survey, 4; weatherships, 3; Great Lakes limnology and meteorological research, 1; shore based lifeboats, 3; Agency tenders, 12; steel landing craft for Northern service, 2; search and rescue 95-foot cutters, 5; search and rescue 70-foot cutters, 1; miscellaneous minor craft, 129.

The fleet is distributed among the 11 Marine Agencies and the St. Lawrence Ship Channel for administration.

Northern Operations

During the Department's annual Arctic resupply operations, 138,475 short tons of cargo were unloaded at 70 ports of call ranging from Goose Bay, Labrador, to points throughout the Eastern and Western Arctic. The cargo consisted of building materials, oil and oil products, construction equipment, machinery, vehicles, and mixed general cargo. In addition, aids to navigation were serviced, direction finding stations were calibrated, and medical and administrative officials of the Department of National Health and Welfare and of Northern Affairs were carried to a large number of northern settlements on board the CCGS *C.D. Howe*.

Arctic operations were severely hampered by exceptionally severe ice conditions, which were considerably worse than had been experienced since the Coast Guard assumed responsibility for Northern re-supply. Two areas of particular difficulty were in Lancaster Sound and Barrow Strait, which were obstructed by large masses of polar ice coming down Wellington Channel, and the ports on the

east coast of Baffin Island, which were obstructed by heavy ice off the Baffin coast. It was only with the greatest difficulty that the re-supply was completed, and a number of the Coast Guard ships suffered ice damage.

Icebreaker support was again made available to merchant ships proceeding to Churchill for the opening of the 1963 grain shipping season. The first ship arrived at Churchill on July 27 and the ice operations officer remained at Churchill throughout the season providing advisory service to the ships trading into the Hudson Bay and Strait. A total of 52 ships loaded 22,864,075 bushels of grain, one ship loaded a cargo of grain screenings and four tankers discharged oil cargoes at the Port. The last grain ship of the season left the port on October 20.

Winter Icebreaking

The Ice Operations Officer, based at Sydney, N.S., again co-ordinated movements of icebreakers and merchant ships in the Gulf of St. Lawrence and the northeast coast of Newfoundland throughout the winter season. The season was relatively mild and a record of 760 passages reported through Cabot Strait between December 15 and May 15, compared with 488 the previous year.

Icebreaker assistance was given to 313 vessels, and routing instruction were provided to all ships that navigated unassisted through the Gulf area. Four ships were escorted to the Miramichi River, the first time in history that the area has been opened to shipping throughout the winter.

A total of 10 ships were broken free by icebreakers and a considerable number of fishermen and sealers were assisted to open water from iced-in fishing ports.

The Department's publication, *Guidance to Merchant Ships Navigating in the Gulf of St. Lawrence in Winter*, again received wide distribution.

Four icebreakers were assigned to opening and maintaining a channel from Quebec to Montreal for flood control purposes. Operations in the Saguenay were completed on March 23, and above Montreal icebreaking was necessary only as far as Beauharnois Canal.

The water level in Montreal Harbour reached a high of 14'11" above chart datum on January 15. Although no ice cover formed over Laprairie basin, unusually favourable weather conditions contributed to relative low water levels for the remainder of the winter.

Crew Training

Courses in navigation, particularly in the use of modern electronic equipment, were made available to Coast Guard officers by the Royal Canadian Navy. Twenty three officers from East Coast Agencies and six from Victoria attended these courses at Halifax and Esquimalt respectively.

Courses in marine weather observing were held at Dartmouth and Quebec, instructors being provided by the Meteorological Branch.

Skin-diving training was carried out on the West Coast by arrangement with the Royal Canadian Navy, and on the East Coast with private agencies.

Correspondence courses introduced last year to help officers and men improve their qualifications have been well received, particularly by engine-room personnel, with a total of 158 enrolled and gratifying successes in examinations.

A course in marine electrics for Coast Guard engineers was organized by the Canadian Westinghouse Company and held at their Hamilton plant.

Ship Construction

During the year, twelve ships were completed, seven were under construction, and 11 were in the design stage.

Completed were: CCGS *Montmagny*; five 95-foot search and rescue cutters; one 70-foot search and rescue cutter; depot vessel CCGS *Narwhal*; CCGS *Skidegate*; a shallow draft vessel CCGS *Tembah*; personnel boat *Kitandoh* for the Civil Aviation Branch; one 95-foot patrol vessel *Hunter Point* for the Fisheries Department.

Under construction are: Weathership No. 1 for Weatherstation "P"; a cable repair and icebreaking vessel for service on the East Coast; two 70-foot search and rescue vessels, *Spray* and *Sprindrift*, for service in Central Canada; tender *Kenoki*, for service at Prescott; a bait vessel, *Arctica*, for the Fisheries Department; and a pilot boat for External Aid Office for service in Barbados.

In the design stage are: Weathership No. 2 for Weatherstation "P"; a triple screw icebreaker for service in the Maritimes and Northern areas; a tender for the Lakehead; an icebreaking supply and buoy vessel to replace the *Chesterfield* and *Saurel*; an icebreaking supply and buoy vessel for the Gulf of St. Lawrence; a tender for the Saint John River; three ferry vessels for CNR service between Nova Scotia and Newfoundland, between North Sydney and Port aux Basques, and for the Prince Edward Island ferry service; a pelagic fisheries vessel for the Fisheries Research Board; and a floating crane for External Aid Office for service in Karachi.

Repairs

Under the supervision of the Ship Construction Branch, repairs totalling \$4,250,000 were carried out on departmental ships, and alterations and additions totalled \$784,750.

RAILWAY SERVICES

Canadian National Railways

The Canadian National Railways operated at a deficit of \$43,013,517 in the calendar year 1963, compared with a deficit of \$48,919,454 the previous year.

Trans-Canada Air Lines

Trans-Canada Air Lines operated at a profit of \$527,875 during the calendar year 1963, compared with a deficit of \$3,540,625 in 1962, a gain of \$4,068,500.

Prince Edward Island Ferry and Terminals

The Prince Edward Island ferry service operated at a deficit of \$3,352,677, compared with \$3,275,166 in 1962, an increase of \$77,511.

During the fiscal year, payments made on ferry construction amounted to \$117,833, and dock construction totalled \$625,611 for Borden and \$39,119 for Cape Tormentine.

Vehicle traffic increased from 199,189 in 1962 to 214,415 in 1963; freight, from 662,827 tons to 735,355 tons; and passengers, from 484,267 to 523,633.

Newfoundland Ferry Service

In addition to the regular North Sydney-Port aux Basques operations, a freight service only is operated from North Sydney to various other Newfoundland ports as required by traffic conditions. The deficit in the operations of this service amounted to \$8,572,936 during 1963, compared with \$8,180,394 in 1962, an increase of \$392,542.

Terminal Facilities—Expenditures on terminal facilities for 1963 were \$27,711 at North Sydney, \$78,989 at Port aux Basques, and \$28,938 on the Argentia service. Total costs for the three at March 31 were \$4,128,536, \$6,636,105, and \$28,938 respectively.

Yarmouth, N.S.-Bar Harbor, Me., Ferry Service

Traffic handled on this service during 1963 consisted of 90,195 passengers, 26,137 cars, 3,010 trucks and 751 other vehicles, compared with 86,192 passengers, 25,641 cars, 2,762 trucks and 504 other vehicles in 1962.

Matane to Ste. Anne des Monts Railway

A location survey made by Canadian National Railways on this proposed line showed the expected cost to be considerably in excess of the \$16,100,000 approved, and it was, therefore, decided to discontinue the project.

Maritime Freight Rates Act

Payments made under the *Maritime Freight Rates Act* during the fiscal year amounted to \$13,405,076, compared with \$12,936,500 the previous year, an increase of \$468,576.

Supplemental Pension Allowances

Supplemental pension allowances payable by the Government of Canada to retired former Newfoundland railway, steamship and telecommunication employees amounted to \$170,493, compared with \$143,781 the previous year.

Victoria Jubilee Bridge

Under the terms of an agreement concerning the removal of tolls from this bridge, total payments during the fiscal year amounted to \$3,842,902. This covered the capital payments, and operating payments from June 1, 1962—the date on which tolls were removed—to March 31, 1964.

Great Slave Lake Railway

This line is expected to be completed by December 31, 1966. The estimated capital cost of the line is \$86,250,000, which includes a 15 per cent allowance for contingencies. Accountable payments for the fiscal year amounted to \$21,700,000, bringing the total of such payments to \$34,425,000 at the end of the year.

FINANCIAL SUMMARY

Comparative Summary of Expenditures and Revenues for the Fiscal Years Ended March 31, 1963 and 1964

	<i>Millions of Dollars</i>		<i>Increase (+) or Decrease (—)</i>
	<i>1963-64</i>	<i>1962-63</i>	
<i>Administration, Operation and Maintenance Expenditures</i>			
Departmental Administration	3.9	3.6	.3 (+)
Air Services	82.0	77.4	4.6 (+)
Marine Services	38.3	37.4	.9 (+)
Railway and Steamship Services	97.2	89.9	7.3 (+)
Miscellaneous Services	134.5	119.3	15.2 (+)
	<hr/> 355.9	<hr/> 327.6	<hr/> 28.3 (+)
<i>Capital Expenditures</i>			
Air Services	39.1	59.5	20.4 (—)
Marine Services	25.8	20.4	5.4 (+)
Railway and Steamship Services	1.7	3.1	1.4 (—)
Miscellaneous Services .....	.4	.2	.2 (+)
	<hr/> 67.0	<hr/> 83.2	<hr/> 16.2 (—)
TOTAL DEPARTMENTAL EXPENDITURES	<hr/> 422.9	<hr/> 410.8	<hr/> 12.1 (+)
<i>Revenues</i>			
Air Services	21.4	19.4	2.0 (+)
Marine Services	6.6	7.0	.4 (—)
Railway and Steamship Services .....	.5	.4	.1 (+)
Miscellaneous Services	2.6	.1	2.5 (+)
	<hr/> 31.1	<hr/> 26.9	<hr/> 4.2 (+)

EXPLANATION OF INCREASES AND DECREASES

Administration, Operation and Maintenance Expenditures

Departmental Administration

There was an increase of \$0.2 million in the cost of departmental administration, which was about equally divided between payroll charges and the cost of professional and special services. Reimbursement of the Department of Transport Stores Account was \$129,000 compared to \$40,000 the previous year.

Air Services

Due in part to the cost of operating the new terminal facilities which became available in 1963-64, the Civil Aviation Branch incurred additional expenditures of \$2.2 million of which \$1.6 million was attributable to payroll items and \$0.5 million to the repair and upkeep of buildings and works. Higher payroll costs with small normal additions in other categories combined to add \$1.3 million to the expenditures of the Telecommunications and Electronics Branch and \$1.0 million to those of the Meteorological Branch.

Marine Services

Headquarters and agency administration costs declined by \$0.1 million due principally to the absence of Exchequer Court Awards of any consequence. Expenditures of the Marine Works Branch for 1962-63 included \$1.7 million for the write-off of the value of land purchased for development of the Cornwall Navigation System. As there was no corresponding expenditure in 1963-64, there was a net drop of \$0.5 million notwithstanding minor increases in other categories. Expansion of the Canadian Coast Guard and additional ship repairs resulted in an increase of \$1.7 million. There was a decline of \$0.2 million in the administration, operation and maintenance costs of the Marine Regulation Branch.

Railway and Steamship Services

Major additional expenditures in this category included an increase of \$9.5 million in the subsidy for the construction of a railway to Great Slave Lake, payments to the Canadian National Railway Company of \$3.8 million due to the termination of the collection of tolls on the Victoria Jubilee Bridge, and \$2.8 million as interest on the cost and expenses of construction of a rail diversion on the same bridge.

The deficit of the Canadian National Railways was down by \$5.9 million and the amount of \$3.5 million required to meet the 1962 deficit of Trans-Canada Air Lines was not needed in 1963-64.

Miscellaneous Services

Capital subsidies for the construction of commercial and fishing vessels and steamship subventions for coastal services increased by \$17.5 and \$1.1 million respectively. These were partly offset by declines of \$2.5 million in payments for the maintenance of rates on freight traffic and \$0.7 million in the amount credited to the Railway Grade Crossing Fund.

CAPITAL EXPENDITURES

Air Services

As three major airport complexes were officially opened during the year, there was an anticipated decline in expenditures on this program. In addition, actual expenditures during the year fell short of the amount estimated due to changes in design of air terminal buildings, non-attainment of the expected stage of completion for various projects, project deferral and delivery delays. The overall reduction in expenditures on construction or acquisition of buildings, works, land and equipment with respect to national airports amounted to \$21.0 million.

Marine Services

Additional expenditures of \$2.3 million were incurred for the dredging of the St. Lawrence Ship Channel and the acquisition of required equipment, and the costs of construction or acquisition with respect to Aids to Navigation and the Canadian Coast Guard were up \$1.3 and \$1.6 million respectively.

Railway and Steamship Services

Expenditures on construction or acquisition of passenger-cargo vessels and equipment as well as harbour facilities for the Newfoundland Coastal Service declined \$1.4 million.

Miscellaneous Services

The capital requirements of canals entrusted to the St. Lawrence Seaway Authority for 1963-64 were \$0.4 million compared to \$0.2 in 1962-63.

REVENUES

Air Services

Civil Aviation Branch revenues rose by \$1.5 million due to increases of \$1.0 million in aircraft landing fees and \$0.4 million from airport concessions, reflecting increased air traffic and air terminal facilities. Amounts credited to revenue during the fiscal year 1963-64 and attributable to the operation of the Telecommunications and Electronics Branch were \$0.4 million more than in the previous year.

Marine Services

Receipts from earnings of the Canadian Coast Guard, arising from northern supply operations, declined \$0.4 million. Harbour dues and wharf revenues increased by \$0.1 and \$0.2 million respectively, helping to offset a non-recurring receipt during 1962-63 of \$400,000.

Railway and Steamship Services

Receipts from the charter-hire of the ferry vessel *John Guy* amounted to \$114,000.

Miscellaneous Services

The St. Lawrence Seaway Authority paid \$2,568,000 as interest on loans. There was no similar payment the previous year.

DEPARTMENT OF TRANSPORT
AIR SERVICES

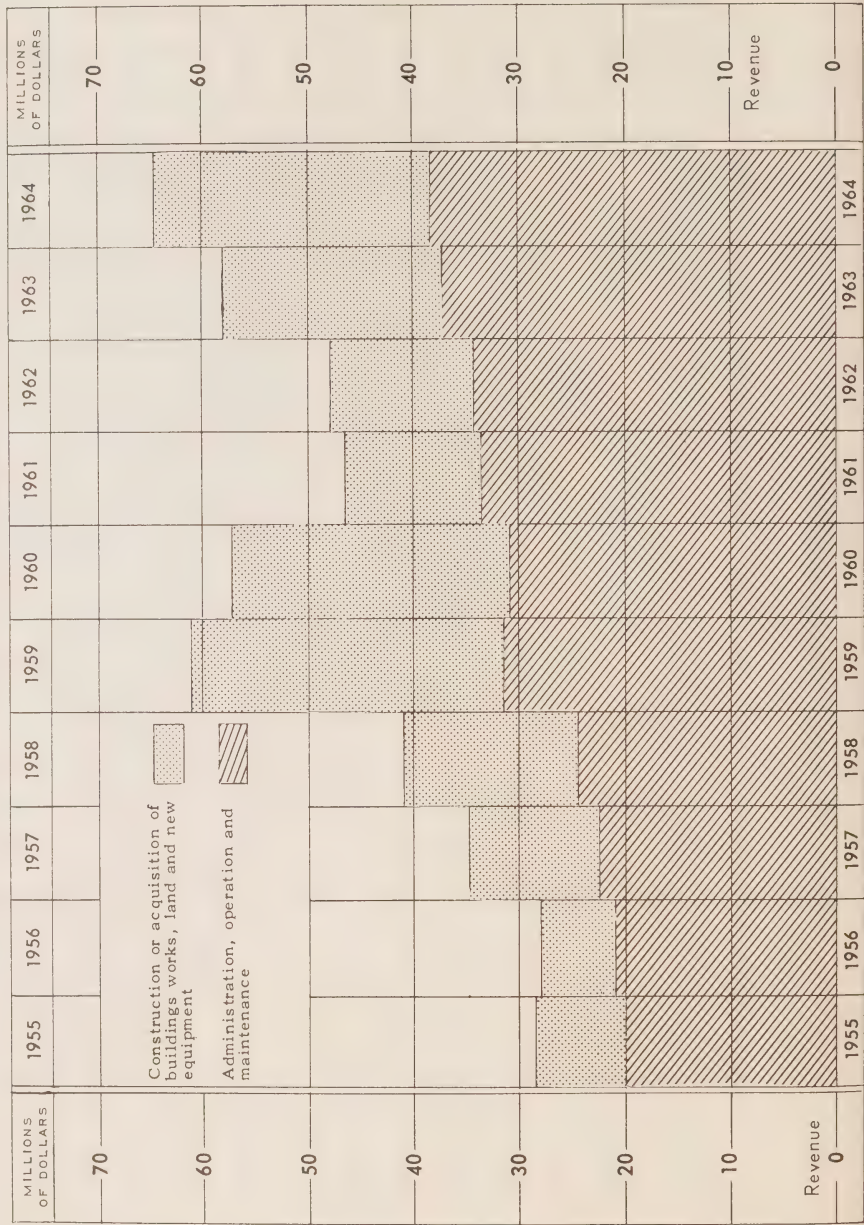
EXPENDITURES AND REVENUES FOR THE FISCAL YEARS 1954-55 TO 1963-64 INCLUSIVE

MILLIONS DE DOLLARS	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964	MILLIONS OF DOLLARS
150.0											150.0
137.5											137.5
125.0											125.0
112.5											112.5
100.0											100.0
87.5											87.5
75.0											75.0
62.5											62.5
50.0											50.0
37.5											37.5
25.0											25.0
12.5											12.5
Revenue											Revenue
0											0

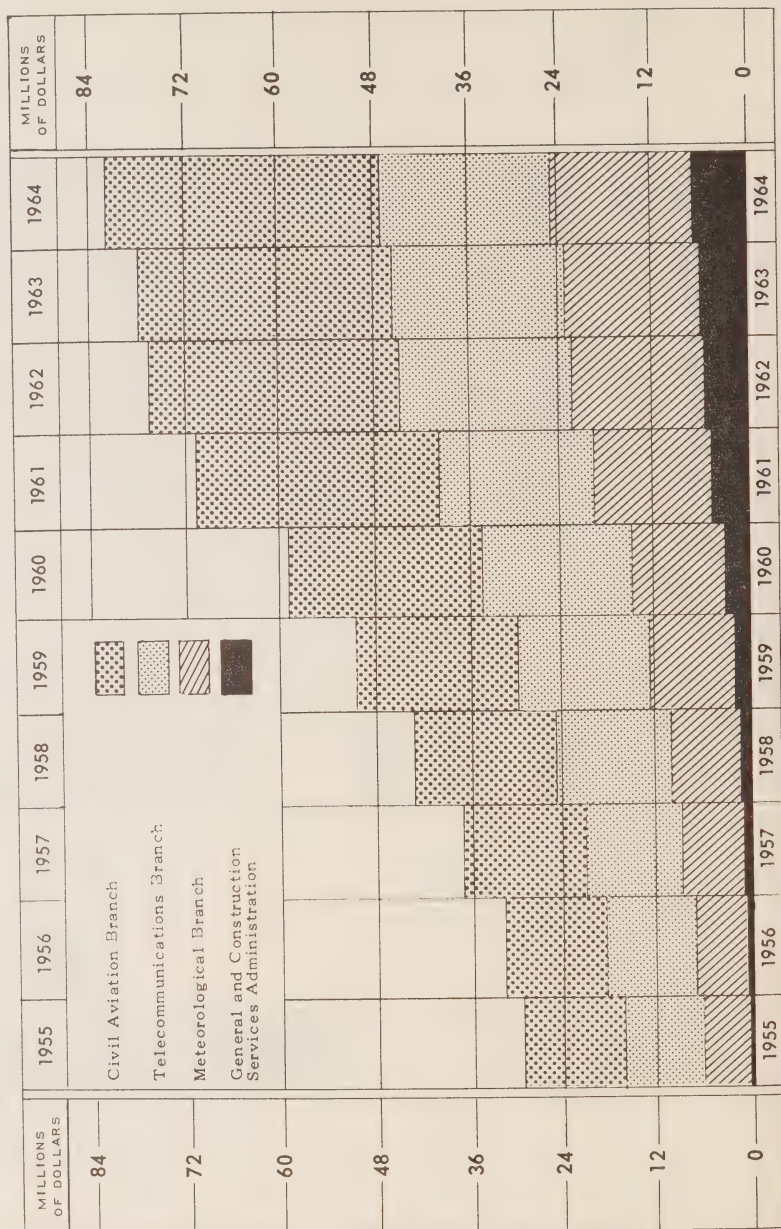
Construction or acquisition of buildings
works, land and new equipment

Administration, operation and maintenance

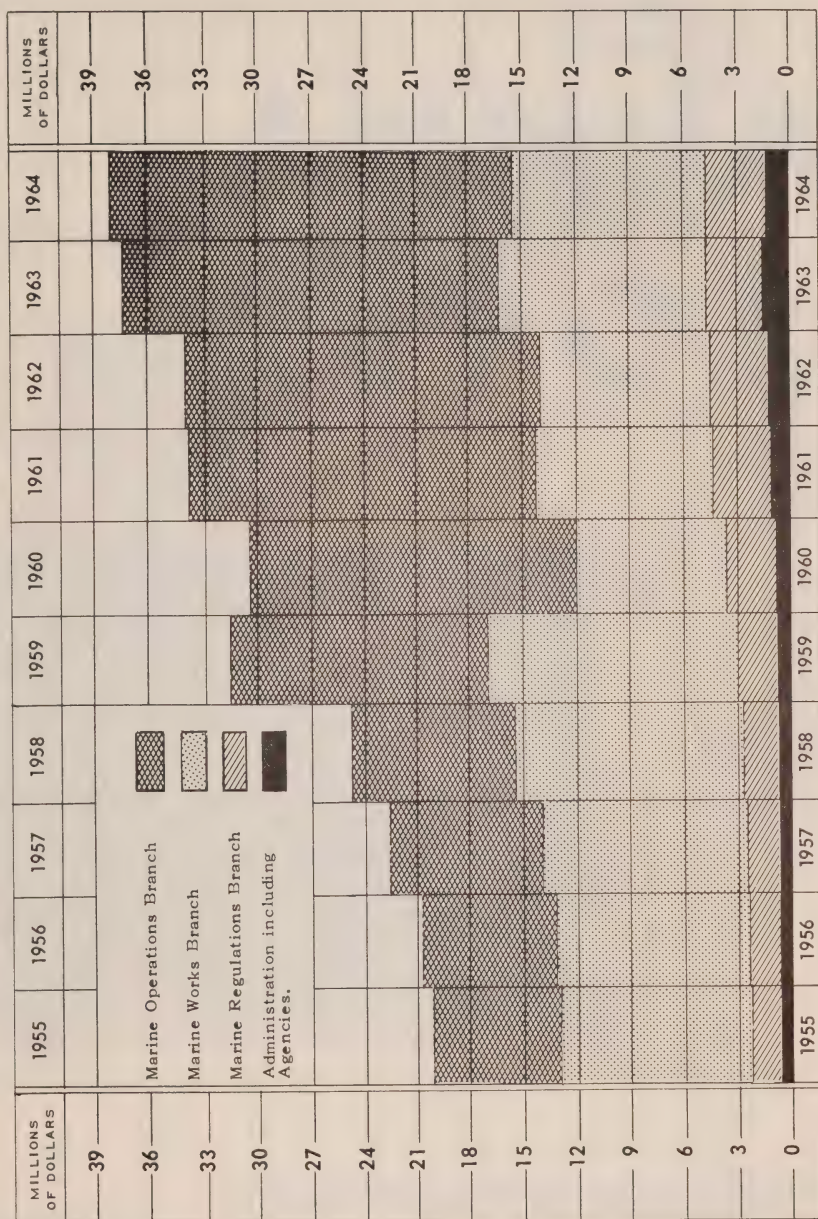
DEPARTMENT OF TRANSPORT
MARINE SERVICES EXPENDITURES AND REVENUES
FOR THE FISCAL YEARS 1954-55 TO 1963-64 INCLUSIVE



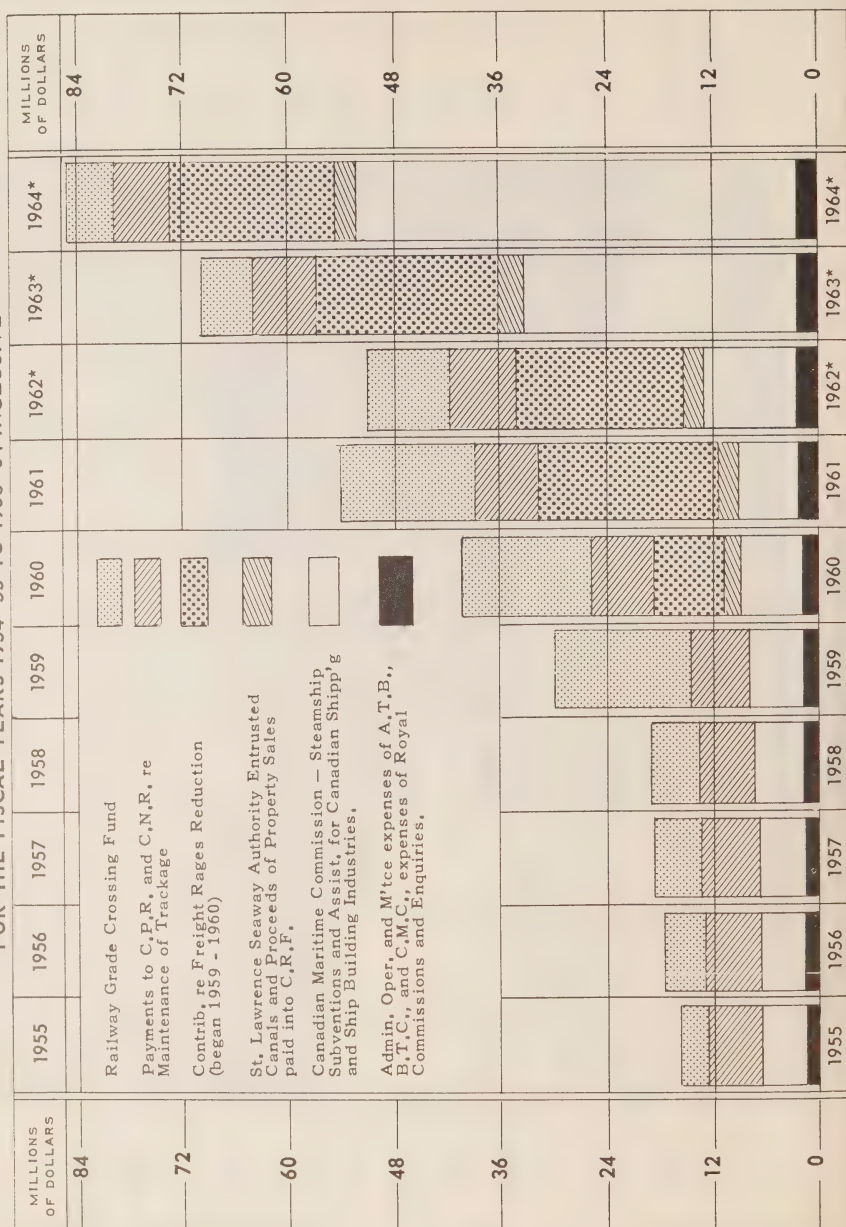
DEPARTMENT OF TRANSPORT
AIR SERVICES- ADMINISTRATION OPERATION AND MAINTENANCE EXPENDITURES
FOR THE FISCAL YEARS 1954-55 TO 1963-64 INCLUSIVE



DEPARTMENT OF TRANSPORT
MARINE SERVICES - ADMINISTRATION OPERATION AND MAINTENANCE EXPENDITURES
FOR THE FISCAL YEARS 1954-55 TO 1963-64 INCLUSIVE



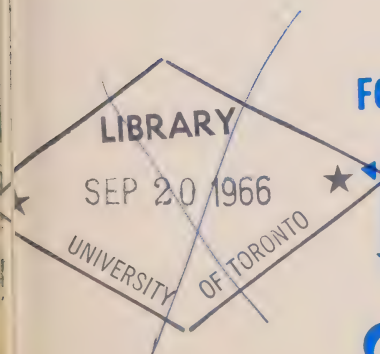
DEPARTMENT OF TRANSPORT
MISCELLANEOUS SERVICES - EXPENDITURES
FOR THE FISCAL YEARS 1954-55 TO 1963-64 INCLUSIVE



DEPARTMENT
OF TRANSPORT

Government
Publications

ANNUAL REPORT



FOR THE FISCAL YEAR ENDED MARCH 31, 1965

1964 - 65

OTTAWA, CANADA

ANNUAL REPORT
Department of Transport

COVER—CCGS *Ernest Lapointe* as the SS *Queen Victoria* which transported Canada East and West delegates to the Charlottetown Conference on Confederation, September 1864. This historic event was re-enacted in September 1964.



CANADA

DEPARTMENT OF TRANSPORT

//

ANNUAL REPORT

FOR THE FISCAL YEAR ENDED

MARCH 31

1965

Submitted Under the Provisions of the
DEPARTMENT OF TRANSPORT ACT



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*To His Excellency Major-General Georges P. Vanier, D.S.O., M.C., C.D.
Governor General and Commander-in-Chief of Canada*

MAY IT PLEASE YOUR EXCELLENCY:

The undersigned has the honour to present to Your Excellency the Annual Report of the Department of Transport, for the fiscal year ended March 31, 1965.

J. W. PICKERSGILL,
Minister of Transport.

ACTS, AND BOARDS, COMMISSIONS AND CROWN-OWNED COMPANIES ADMINISTERED BY

MINISTER OF TRANSPORT

Boards, Commissions and Crown-Owned Companies

Air Canada
Air Transport Board
Atlantic Development Board
Board of Transport Commissioners
Canadian Maritime Commission
Canadian National Railway Company
Canadian Overseas Telecommunication Corporation
National Harbours Board
St. Lawrence Seaway Authority
Steamship Inspection Board

Acts

GENERAL

Bills of Lading Act
Canadian Overseas Telecommunication
Corporation Act
Department of Transport Act
Telegraph Act
Transport Act

AIR SERVICES

Aeronautics Act
Carriage of Goods by Air Act
Foreign Aircraft Third Party Damage
Radio Act
Air Canada Act

MARINE

Belleville Harbour Commissioners Act
Canada Shipping Act
Canadian Maritime Commission Act
Canadian National Steamships Act
Government Harbours and Piers Act
Government Property Traffic Act
Government Vessels Discipline Act
Fraser River Harbour Commissioners
Act
Hamilton Harbour Commissioners Act
Lakehead Harbour Commissioners Act
Live Stock Shipping Act
Nanaimo Harbour Commissioners Act

National Harbours Board Act
Navigable Waters Protection Act
North Fraser Harbour Commissioners
Act
Oshawa Harbour Commissioners Act
Port Alberni Harbour Commissioners
Act
St. Lawrence Seaway Authority Act
Toronto Harbour Commissioners Act
Water Carriage of Goods Act
Windsor Harbour Commissioners Act
Winnipeg and St. Boniface Harbour
Commissioners Act

RAILWAYS

Canadian National Railways Act
Canadian National-Canadian Pacific Act
Canadian National Railways Financing
and Guarantee Act
Canadian National Montreal Terminals
Act
Canadian National Railways Pensions
Act
Canadian National Toronto Terminals
Act
Government Railways Act
Intercolonial Railway and P.E.I. Rail-
way Employees Provident Fund Act
Maritime Freight Rates Act
Railway Act

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Runway snow clearing at Montreal International Airport.

AIR SERVICES

Airports

Development—Major contracts for construction of runways, taxiways, aircraft aprons, car parks and roads were completed at a number of sites including Saint John, N.B., Matane and Sept Iles, P.Q., Hamilton, Windsor, Ottawa, North Bay, and the Lakehead, Ont., Medicine Hat, Alta., Kimberley, Pitt Meadows, Terrace, Victoria and Westview, B.C., and Watson Lake and Whitehorse, Y.T. Similar contracts were awarded for 20 other sites.

Major Terminals—Plans and specifications were completed for tender call for a new terminal building at the Vancouver International Airport.

Standard Terminals and General Buildings—New air terminals at Fredericton, N.B.; London, North Bay, Sault Ste Marie, Ont.; Kamloops and Victoria, B.C.; and Yellowknife, N.W.T., and extensions and alterations to the air terminal building at Moncton were completed.

Alterations and extensions to the air terminal at Grande Prairie, Alta., are under way, and tenders were called for similar work for the air terminal at Sept Iles, P.Q.

In the planning stage are the large air terminal building complex for Katunayake, Ceylon, (under the Colombo Plan), and new air terminal buildings for Sydney, N.S., and Bagotville, Saguenay and Val d'Or, P.Q. Also in the planning stage are a radio control building at Goose Bay, Lab., an aeradio station and five dwellings at Burwash Landing, Y.T., an aircraft parts storage building at Ottawa, an air traffic control station at North Bay, and an extensive conversion project for the Coast Guard School at Sydney.

Other projects under way include a transmitter building at Ottawa; VOR (Very High Frequency Omni Range) buildings at Baie Comeau, Mont Joli and Sept Iles, P.Q.; field electrical centres at Sudbury and Timmins, Ont.; Prince George,

B.C.; and Whitehorse, Y.T.; the relocation of the rawinsonde station at Moosonee, Ont.; and sand storage buildings for London, Ont.; and Montreal, P.Q., airports.

Contracts were awarded for a satellite communication station, including a control building, powerhouse and ancillary buildings, at Mill Village, N.S.; a Loran "C" station with a 1,350-foot tower at Cape Race, Nfld.; a maintenance garage and fire-hall building housing the heating plant for the proposed air terminal building at Sydney; maintenance garage and airport services building at Montreal and Toronto International airports; sand storage buildings for Halifax, Quebec, Ottawa, North Bay and Edmonton airports; a Decca Chain coast station for East Newfoundland; a marine radio station at Riviere du Loup, P.Q.; a VHF/UHF transmitter building at Fredericton; a field electrical centre for Winnipeg; and modifications to the VOR building at Sandspit, B.C.

Other Projects—Cathodic protection systems to prevent corrosion of underground heating mains and fuel storage tanks were completed at Fredericton, Montreal, Toronto and the Lakehead and investigations were carried out at a number of other sites.

An agreement was completed with the Greater Vancouver Sewerage and Drainage District to accept sewerage from the new terminal area. The design of a hydrant refuelling distribution system was undertaken for Vancouver International Airport.

Contract documents for moving sidewalks in the tunnels connecting the main aeroquay with Montreal air terminal building were completed and tenders will be called in the next fiscal year.

Water supply and sanitary sewage disposal facilities were investigated and installations constructed at 22 sites.

Power and Lighting—Visual aids to aircraft were provided at 62 sites, and other facilities such as road and car park lighting were installed at nine sites.

Electrical power services to six air terminal buildings were completed and placed in operation, and six others are in various stages of planning and construction. Three major power distribution systems, involving several miles of overhead and underground circuits, were completed, and work was started on an additional two similar systems.

Electrical power services to 29 buildings and other facilities were installed and work proceeded on an additional 40. Sixty-eight other projects, including power line relocations, power switchgear replacements and diesel generator unit modifications were undertaken with 27 projects being completed.

Operations—The Department assumed the financial responsibility for Resolute aerodrome, N.W.T., and on April 1 an airport manager was placed in charge and the aerodrome was transferred to the Winnipeg Region for operation and maintenance.

Torbay airport was taken over from the RCAF on April 1. Most of the station is being transferred to the Government of Newfoundland, the department retaining control of the hangar as well as a number of operational buildings.

Reduction in operations at Frobisher continued during the year and all airport operations are now in the Federal Building. The building is now under the management of the Department of Northern Affairs and National Resources, but DOT continues to operate single staff messing there.

Other sites taken over by the department on withdrawal of the Department of National Defence are: Hamilton (Mount Hope), now leased to the City of Hamilton

as a municipal airport operation; Saskatoon, where the RCAF station was closed down and buildings and facilities were turned over to the Department, with the exception of three hangars. The department is now negotiating a land exchange with the City of Saskatoon, as much of the former National Defence area is surplus to departmental requirements.

The former National Defence area of Calgary airport was transferred to the Department and now comprises a part of the airport which is being leased to the City of Calgary for municipal airport operations.

The RCAF station at Sea Island was closed down and most of the land and buildings were transferred to the Department. Many of the buildings are being declared surplus to departmental requirements, and the large recreation centre was turned over to the town of Richmond for operation on the site.

The Rockcliffe seaplane base has been leased to Laurentian Air Services for civilian flying operations.

At Churchill, the Royal Canadian Artillery station was closed and is now being operated jointly by the Departments of Public Works and Transport, the latter operating and maintaining the airfield.

The aerodrome at Casey, P.Q., was declared surplus by National Defence, Transport having no requirement for the site, and the department transferred control of Pagwa airport to National Defence.

Equipment and Maintenance—A total of 50 pieces of major equipment were purchased during the year as replacements, or additions to handle increased maintenance requirements.

Five crawler tractors were replaced, four of which were for the remote locations of Cambridge Bay, Norman Wells, Baker Lake and Coral Harbour.

The new 2,000-gallon water-nurse truck is now in production and 10 are expected to be delivered during the coming fiscal year.

Montreal and Toronto International Airports were each equipped with two new Pyrene/Sicard foam trucks, Edmonton and Halifax each with one. The new trucks carry 1,000 Imperial gallons of water and 165 Imperial gallons of foam liquid for the production of crash fire-fighting foam.

The responsibility for providing fire protection services at Vancouver International Airport was transferred to this department from the Department of National Defence.

Extensive crash fire rescue training courses were carried out at both Fort St. John and Halifax airports. These courses were for classified fire officers and fire fighters and, for the first time, a number of volunteer fire fighters.

The third annual Air Services fire prevention contest was held concurrently with the Canadian Government and the National Fire Protection Association international contest, with an entry list of 64.

Fire Losses—Fire losses were at an all-time low of \$12,214.50.

Operating Subsidies—Operating subsidies were approved for payment for the following airports: Trenton, N.S.; Saint John, N.B.; Rouyn, Rivière du Loup and Forestville, P.Q.; Flin Flon, Dauphin and Brandon, Man.; Beaverlodge and Prince Albert, Sask.; Medicine Hat and Peace River, Alta.; and Castlegar, Campbell River, Dawson Creek, and Kelowna, B.C.

Capital Assistance—Grants totalling \$35,556 for improvements to two remote airports were provided to the villages of Natashquan and Rivière au Tonnerre, P.Q.

Approximately 50 applications for assistance were received—four for remote airports, two for development airports, and the remaining in the local category.

Because of a study being made to establish a new basis for airport capital assistance, none of the applications for local airport assistance were processed.

Revenues and Expenditures—Expenditures increased by some \$3,650,000 to approximately \$24,000,000, and revenues by some \$5,400,000 to approximately \$22,512,000. Part of the revenue increase resulted from the collection of landing fees which became due automatically with the cancellation of the air route facility fee. Both the cancellation and the imposition of landing fees were retroactive and arrears collected totalled some \$1,250,000.

Licensed Airports—At the end of the fiscal year there were 675 airport licences in force, an increase of three over the previous year.

Air Traffic Control

The number of airport traffic control towers in operation increased from 31 in 1963 to 33 in 1964. Control towers commenced operation at Fort St. John and Prince George, B.C., in April, in addition to the department taking over the control tower at St. John's, Nfld., from the Department of National Defence. Frobisher control tower ceased operation on September 24, 1964, because of changes in airline traffic requirements. Airline long range jets replaced the shorter range piston aircraft using the Polar Route, eliminating landings to refuel at Frobisher.

Aircraft movements controlled by the Department's 33 airport traffic control towers totalled 2,281,958 for 1964. Of these, 47 per cent were local, civil; 23.2 per cent were itinerant, civil; 14.4 per cent were air carrier; 6 per cent were local, military; 5.6 per cent were itinerant, military; and 3.8 per cent were simulated approaches, both civil and military.

The eight area control centres handled 701,725 IFR (Instrument Flight Rules) flight plans and 188,767 VFR (Visual Flight Rules) flight plans.

Gander Area Control Centre oceanic low and high level operations for the year rose by 1,039 or one per cent from 72,529 in 1963 to 73,568 in 1964.

Air traffic control evaluation projects during the year included Secondary Surveillance Radar (SSR); airport surface detection radar (ASDE); terminal scan converted display consoles (SCD); time lapse photograph for radar flight checks; and radar remoting.

Airways and Air Routes

On March 31 there were 31,871 nautical miles of designated low altitude airways, 10,158 nautical miles of low altitude air routes, and 27,558 nautical miles of high altitude airways.

Airmen Licences

At the end of the fiscal year there were 24,371 airmen licences in force, compared with 24,350 the previous years. These were classified as follows, with 1963-64 figures in brackets: Pilots—glider, 775 (686); private, 16,015 (16,085); commercial 2,571 (2,552); senior commercial, 341 (379); airline transport, 1,418 (1,399);

flight navigators, 94 (92); air traffic controllers, 788 (819); flight engineers, 37 (36); aircraft maintenance engineers, 2,332 (2,302).

A total of 3,711 airmen licences were issued during the same period, compared with 3,549 the previous year. By classification, the totals are as follows, with last year's figures in brackets: Pilots—glider, 94 (86); private, 2,750 (2,753); commercial, 553 (385); senior commercial, 61 (61); airline transport, 129 (71); flight navigator, 11 (11); air traffic controller, 10 (22); flight engineer, 5 (14); and aircraft maintenance engineers, 98 (146).

Of the 2,750 pilots who obtained private licences, 1,211 or 44 per cent were trained under the scheme of assistance sponsored by the Department. Thirty-three flying clubs and 81 flying schools participated in this training program.

Aircraft Licensing

Civil aircraft registered at the end of the fiscal year showed an increase of 453 or 6.9 per cent. Of the 7,016 registered, 2,023 were commercial, 4,799 were private, and 194 were State, compared with 1,984, 4,389 and 190 respectively the previous year.

Aircraft Accidents

During the calendar year 1964 there were 268 accidents, exclusive of minor ones, involving Canadian registered aircraft engaged in civil flying. In addition there were some 20 accidents reported involving foreign registered aircraft engaged in flight flying within the territorial limits of Canada.

Fatalities totalled 70, compared with 210 in 1963. One accident—with 118 fatalities—occurred in 1963.

Air Carriers

On March 31 there were 675 commercial air carriers operating the various types of commercial air services in Canada, of which 401 were Canadian air carriers and 274 were foreign and Commonwealth air carriers.

Flight Services

At the end of the year under review, the departmental fleet consisted of 40 fixed-wing aircraft and 20 helicopters. Of the helicopter fleet, two are operated by the Department on behalf of the Department of Mines and Technical Surveys and are based primarily on the Canadian scientific ship *Baffin* operating along the Maritime Coast and in the Eastern Arctic.

A Sikorsky helicopter based in Prince Rupert, B.C., is used primarily in servicing lighthouses along the West Coast and the emergency evacuation of lighthouse personnel.

The other helicopters are used for training, and helicopter support on board Canadian Coast Guard vessels serving the St. Lawrence River, East and West Coasts, in the Great Lakes, and in the Arctic.

The annual summer oil pollution patrol of the St. Lawrence River, previously carried out from Cornwall to Quebec, was extended from Cornwall to Toronto and the Great Lakes region.

In addition to normal maintenance requirements for aircraft operating from

Ottawa, the aircraft maintenance and overhaul base carried out 32 engine changes, eight overhauls on fixed-wing aircraft and 12 overhauls on helicopters.

Aeronautical Engineering

Six aircraft type approvals, eight supplemental, and one aircraft engine type approval were issued during the past year. Fifteen approvals were revised to cover aircraft configuration and equipment changes.

The design and construction of two models of plastic aircraft floats were started during the year and work is continuing toward type approval of these components.

Work continued with the certification of one rotary wing, one twin-engine turboprop and one twin-engine utility, special-purpose aircraft.

Technical supervision continued over all civil operators, manufacturers, and aircraft repair and engine overhaul organizations.

The Airworthiness Inspection staff has been increased both in the Regions and at Headquarters. This has been made necessary by the increased work-load of manufacturing, repair and overhaul shops, airlines and routine aircraft inspections. The number of ultra-light aircraft being constructed by individuals and clubs has also increased considerably.

Eight company approvals were granted during the year, bringing the number of companies now operating under this authority to 56.

Radio Regulations

Licensing—Radio station licences in force at the end of the fiscal year totalled 136,912, compared with 118,354 the previous year. This includes stations operated by departments of federal, provincial and municipal governments, stations on ships and aircraft registered in Canada, also mobile stations operating the public and private land mobile services, but does not include private commercial broadcasting licences.

General radio service licences issued totalled 1,714 compared with 10,819 the previous year. These licences are valid for three years, and a total of 36,112 were in force at the end of March.

Safety Radio Surveys, Inspections and Suppression of Interference—Radio Regulations Inspectors, operating from 30 field offices throughout Canada, conducted 1,305 ship station radio surveys and 15,893 inspections of stations of various classes to ensure compliance with Canadian laws and international conventions and treaties.

Interference complaints received totalled 16,037 and 15,861 were completed, compared with 27,650 and 27,134 respectively the previous year.

To promote effective application of acceptable practices in keeping with specifications and standards set by the Department, Radio Inspectors maintain close liaison with manufacturers and distributors of aviation and marine radio equipment, and also with organizations engaged in the use, installation, repair and overhaul of such equipment.

Examinations and Certificates of Proficiency in Radio—During the year, 5,491 radio operator examinations were conducted, compared with 5,439 the previous year, and 5,262 certificates of proficiency were issued compared with 5,030 in 1963-64. As of March 31, the total number of certificates issued was 81,789.

Broadcasting

Applications received for licences to establish amplitude and frequency modulated private commercial broadcasting stations (sound) and for changes of facilities in existing stations totalled 188.

For licences to establish private commercial broadcasting stations (television) and for changes of facilities in existing stations, applications totalled 89, and 252 applications were received concerning land stations performing a commercial broadcasting receiving service (CATV).

Applications concerning stations performing an auxiliary service to broadcasting stations totalled 118, and applications for transfers of stock, change in ownership or change in name of licensee totalled 198.

A total of 78 private commercial broadcasting stations (sound and television)—new or additional facilities—commenced operation. For unattended operation of broadcasting stations using supervisory control systems, 52 applications were received and approved. Thirteen multiplex FM stereophonic broadcasting systems have come into operation and seven stations are employing subsidiary communication operations.

The Board of Broadcast Governors was supplied with such data as coverage maps, population statistics and other technical information for new private commercial broadcasting station licences and applications for changes of the facilities of existing stations.

Radio Standards and Frequency Utilization Planning

The development of radio standards specifications and procedures continued throughout the year and fourteen draft specifications were prepared.

In the Toronto, Montreal, Winnipeg and Vancouver areas, the increased use of frequencies between 150.8 mc/s and 174 mc/s by land mobile service users has caused congestion, and studies were undertaken to form the basis of remedial action. The results of these studies were referred to the Canadian Radio Technical Planning Board for further study and recommendation.

At the Radio Regulations Engineering Laboratory considerable work was done on the evaluation of methods of measurement used in radio standards specifications for specialized radio equipment such as airborne transponders and crash position indicators. Using the mobile laboratory, five field projects were undertaken to investigate antenna patterns and radar spurious emissions.

Under the Radio Apparatus Testing Fee Regulation of the Financial Administration Act, a total of \$10,125 was collected in fees for the type-approval testing of 32 units.

A total of 49 proposed power lines in Saskatchewan, Newfoundland, Quebec, and Ontario were examined for possible interference to radio telecommunication.

A total of 266 applications for radio systems operating in the VHF, UHF, and SHF bands were examined. This again reflected the requirement in Canada for the use of the diversified telecommunication services to convey telephony, television, data and telemetry signals. The increased use of microwave systems by hydro-electric interests to facilitate the generation, distribution, and control of electric power is a significant development.

Licensees who plan to install radio stations in the microwave bands have continued to use arrangements organized by the department for the advance co-ordina-

tion of their planned stations. A total of 78 proposed systems were received and checked and potential interference problems were averted by changes to equipment and antenna systems.

Work progressed on an automatic data processing system for the co-ordination and recording of radio stations in the microwave bands. Using a flexible electronic computer, this system will (a) execute co-ordination calculations to determine if a new station interferes with existing stations in an environment, (b) produce accurate domestic frequency lists and records, and (c) provide international lists in a format suitable for notifications to the International Telecommunication Union.

A new design was prepared for small mobile monitoring stations to be used in locations where monitoring work is required but it is uneconomical to build a permanent station. They will also be used for surveillance and direction finding purposes in connection with enforcement against illegal stations, as well as for certain specialized engineering investigations such as congestion in the VHF part of the spectrum in particular areas.

Radio Communications and Aids to Navigation

Marine—Shore Stations—Marine communications completed during the year included a marine radio station at Rivière du Loup; remote receiver site at Saint John, N.B.; receiving satellite at Lockport, N.S.; remote transmitter site at Sarnia, Ont.; and a satellite VHF station at Fonthill, Ont.

New facilities under construction include marine radio stations at Comfort Cove and St. Lawrence, Nfld., to replace Twillingate and Burin respectively; a remote transmitter site at Toronto; and VHF installations at Cornwall pilotage and Port Burwell.

Ship Stations—Marine consoles, having the main transmitter capable of single sideband operation, have been fitted into the new cable repair ship CCGS *John Cabot* and in the SS *Patrick Morris*. The latter is operated by the Canadian National Railways in the Newfoundland service. This is the beginning of a program to modernize high and medium frequency communications in Canadian Coast Guard vessels. Similar installations are now in progress in the CCGS *John A. Macdonald* and CCGS *d'Iberville*. A program is under way for providing General Radio Service equipment for the Great Lakes search and rescue cutters and the Mackenzie River fleet.

Fixed/Aeronautical Communications—Peripheral circuits were completed from the Moncton area control centre to Mont Joli and Cape North, from Goose area control centre to Knob Lake, and from Gander area control centre to St. John's, Nfld.

Extended range VHF installations for air-ground communications in the Goose upper information region were completed at Resolute and Alert, N.W.T.

Other projects completed during the year included remote transmitter sites at Fredericton, Roberval, Regina, Edmonton and Calgary; remote receiver sites at Saint John, Frobisher, Montreal and Edmonton; and a new operations building at Roberval.

New communications equipment was installed in control towers and aeradio stations at the Lakehead and Fredericton, in control towers at Prince George and Fort St. John, and in aeradio stations at Fort Nelson and Sault Ste. Marie.

Low Frequency Aids—Marine radiobeacons of various types were established at Grappling Island, Lab., Sambro Island, Cape Roseway and Hartlen Point, N.S.,

Southwest Head, N.B., Cape Beal, Albert Head, and Point Atkinson, B.C., and Goodwin Island, Mansel Island and Coat's Island, N.W.T.

Aeronautical radiobeacons were completed at Deer Lake, Nfld.; Hamilton and Kitchener, Ont.; Broadview, Sask.; and Kamloops and Kelowna, B.C.

A Loran "C" station is under construction at Cape Race, Nfld. at a cost of \$5,000,000. The station is being financed by the U.S. Coast Guard and will be completed in the fall of 1965.

The work of rehabilitating the East Newfoundland Decca navigator chain, begun this year, should also be completed in the fall of 1965.

VOR/TACAN—Doppler VOR (Very High Frequency Omni Range) installations were completed and flight checked at Port Hardy and Sandspit, B.C. Standard VOR facilities were commissioned at St. John's, Nfld.; Quebec, P.Q.; and Kleinburg and Sudbury, Ont.; and relocated at Windsor and Ottawa. At Princeton, B.C., the mountain-top VOR was completed but additional work is required at the Kimberley and Enderby sites.

Eight omni-test equipments were installed and commissioned at various locations in Canada, with seven more planned. These units provide aircraft with a test signal whereby the calibration of their VOR receivers can be checked while on the ramp, taxiing, or while in close vicinity of the airport.

Co-location of Department of National Defence TACAN (Tactical Air Navigation) equipment at 22 departmental VOR stations is well advanced. Installation was completed at Vancouver, Saskatoon and Winnipeg, with commissioning expected during April 1965. Eight more stations were added to the program and the 30 stations are scheduled for completion by August 1966.

Instrument Landing Systems—Instrument landing systems were completed at the Air Services training school at Carp, Ont., and at Whitehorse, Y.T.; the localizer serving runway 08 at Vancouver International Airport was rebuilt and relocated. Special localizer antennae were installed at Port Hardy and Abbotsford, B.C., and a special glide path system was installed at the latter to overcome site problems. The glide path system at Montreal 06L was replaced by new equipment.

New ILS flight inspection procedures for the evaluation of facilities to new ICAO standards were developed and used first at Toronto.

Radar—Precision approach radar (PAR) was installed at Halifax, Toronto, Winnipeg and Vancouver, and a PAR simulator is on order for the Air Services training school at Carp, Ont.

At Halifax, Toronto, Winnipeg and Edmonton, C-band weather radar was installed, and a mobile meteorological research system, including a C-band weather radar, will be installed in two trailers.

Installation and check-out of the ASR-3 radars at Montreal, Toronto and Vancouver progressed, and an ASR-5 radar is being obtained for Winnipeg International Airport.

The design of secondary surveillance radar equipment was completed by the supplier and acceptance tests were completed. This equipment will be installed at 19 airports across Canada during 1965-66.

Maintenance and Operations

Technical direction of the Canadian ionosphere service, including maintenance

of stations at St. John's, Ottawa, Kenora, Churchill and Resolute, and processing, publishing and distributing ionospheric data was taken over from the Defence Research Board on September 1, 1964.

As a result of a continuing review of operational requirements for existing navigational aids and services, two low frequency radio ranges were replaced by radio beacons, air-ground navigation facilities were removed from Pagwa, Ont., and plans were completed to down-grade several other stations.

Traffic volume on the air operational teletype network increased by approximately 20 percent. Circuit mileage increased from 25,321 miles in 1960 to over 50,000 miles by January 1, 1965. Major changes during the year were conversion of circuit operation speed from 60 to 75 words per minute, selectorization of circuits to ensure privacy of communications, and provision of a direct circuit from Toronto to Winnipeg. Automation of this network commenced with automatic message switching facilities being commissioned at Vancouver, Edmonton and Winnipeg during the year.

Effective June 1, 1964, Canada became an active participant of the Atlantic Merchant Vessel Reporting System (AMVER) developed by the United States Coast Guard. Canadian coast stations now accept AMVER reports from participating ships for forwarding via RCAF Halifax Station to the AMVER centre in New York.

The plan for co-ordination of the marine radiobeacon system of Canada with that of the U.S. in six-station sequence continued. The plan is now complete on the West Coast and Great Lakes and is nearing completion on the East Coast.

Research and Development

Space Systems—At the Department's experimental satellite communication ground station at Mill Village, N.S., the construction of buildings, including the radome with annex has been completed, and the station is ready for the installation of the electronic systems. Installation is scheduled for completion at the end of October 1965. The station will be suitable for operation with various types of satellites, including Comsat's (Communications Satellite Corporation) "Early Bird", and the NASA (National Aeronautics and Space Administration) designed ATS satellites. In the interim the station will be used by Canadian Overseas Telecommunication Corporation for commercial communications via "Early Bird".

Navigation Aids, Radar and Video Systems—Studies underway include the evaluation of shelters, power supplies and telemetering for unattended facilities at isolated sites; systems which would be capable of transmitting primary and secondary radar data over a narrow-band channel; doppler radar for cloud physics investigations; and available theory on Sferics.

The design and assembly of a system was started whereby the video obtained from a vertical pointing radar will be recorded by a paper recording unit. The paper recording will show the vertical profile of cloud formations.

Landline Services

Air traffic control interphone service was expanded. Express circuits, including selective signalling features, being provided between Toronto and Detroit, and Toronto and Cleveland, an express circuit between Dawson Creek and Fort St. John, "hot line" circuits between Halifax and Shearwater, Toronto and Downsview,

Toronto and Cleveland, and Vancouver and Seattle, and inter-sector communication systems at five area control centres.

Pushbutton equipment for the termination of interphone circuits was provided at Victoria, Fort St. John, Calgary, Lakehead and Quebec, and will be installed at four other locations.

The airops teleprinter network was modified by establishing leased service between Fort Smith and Fort Simpson, and orders have been issued for extension to Wrigley, Norman Wells, Fort Good Hope and Inuvik. Existing circuits Montreal-New York-Gander, Winnipeg-Toronto, and Toronto-Ottawa-Montreal were modified and rearranged.

Teletypewriter service was provided at four new locations and TELEX at 15.

Weatherfax service was extended to Sudbury, Toronto Island, Sault Ste. Marie, and Saint John. In accordance with World Meteorological Organization planning and recommendations, START/STOP signalling was provided on the national and supplementary networks.

Weather teleprinter service was extended to Baie Comeau, Whitecourt, Fort Smith, Smith River, Teslin, and six emergency Regional Headquarters.

TELEX service was provided at Edmonton, Jasper and Coronation, and orders have been issued for similar service at four other locations.

Approximately 630 project applications for additions or revisions to leased private line or departmentally-owned services were prepared and processed along with about 216 applications for additions to, or revisions of telephone service and inter-communication systems.

CENTREX telephone exchange service was installed at Montreal International Airport and requirements were reviewed for overall Government CENTREX service in the Toronto and Montreal areas.

The departmentally-owned cable plant at five sites were disposed of and negotiations are under way for similar action at 13 other sites.

Government Administrative Telecommunications

As a result of Glassco Commission recommendations, an Administrative Telecommunications Agency (ATA) was established in the department in December 1964, to administer consolidated government administrative telephone and other telecommunications services. To provide the most adequate telecommunications services with economy, an overall assessment is required and, to this end, surveys were undertaken.

International Conferences

In August at a Plenipotentiary Conference in Washington, inter-governmental and overseas communication entity agreements were signed governing the setting up of an International Communications Satellite Consortium. This conference was preceded by three preparatory conferences in London early in the year, in which departmental officers participated.

The Consortium, which is responsible for establishing and operating a Commercial Communications Satellite System, carries out its work through the Interim Committee for Satellite Communications. The Canadian Overseas Telecommunication Corporation represents Canada on the Consortium.

As a member of the Administrative Council of the International Telecom-

munication Union (ITU), Canada participated in the nineteenth session held in Geneva from April 6 to May 8, 1964. The department was also represented at other ITU conferences including the Third Plenary Assembly of the International Telegraph and Telephone Consultative Committee in Geneva June 15-27, Study Groups of the International Radio Consultative Committee in Monte Carlo February-March, 1965, and the Latin American Plan Meeting in Santiago, Chile, in March 1965.

Representatives of the department also attended meetings of the NATO Civil Communications Planning Committee in Paris, the Commonwealth Telecommunications Board in London, and an ICAO Special North Atlantic Regional Air Navigation meeting in Montreal.

Meteorological Services

Observing

Surface—A surface observing network of 285 stations provided synoptic and/or aviation weather observations by teletype, radio, telegraph or telephone. Of the 232 stations reporting aviation observations, 161 provided 24-hourly coverage. Forty of the surface network stations took pilot balloon observations, 44 participated in the continuing International Quiet Sun Years noctilucent cloud program, and 63 stations comprised a visual auroral observing network, also one of the International Quiet Sun Years co-operational programs.

The snow survey program was expanded from 12 to 43 stations. Thirty stations began a frost depth program, collecting data for the benefit of the Construction Branch and the construction industry.

Merchant and other vessels engaged in marine weather reporting under the supervision of the Meteorological Branch totalled 117, an increase of 10 from last year. Of these, 57 ships reported from the Atlantic Ocean, Eastern coastal waters and Eastern Arctic areas, 25 from Pacific Ocean and Western Arctic areas and 35 from the Great Lakes. During 1964, these ships made approximately 32,700 observations, an increase of about 500 over the previous year.

Port Meteorological Officers supervised the weather observing programs of these ships, and provided advice and assistance in meteorological matters to domestic and foreign shipping. During the year these officers, located at Halifax, Saint John, Montreal and Vancouver, made 1,907 visits to ships of more than 20 nationalities.

Upper Air Observations—Upper air observations were taken at twelve-hour intervals by a network of 32 upper air stations. The data obtained are essential in the preparation of weather forecasts both for civilian and military requirements and are, accordingly, transmitted promptly to forecast centres throughout North America and overseas.

Ozonesonde observations were taken at Goose Bay, Labrador and Churchill, Man., using special combined ozonesonde-rawinsonde instruments.

Seismological Program—Carried out on a co-operative basis over the past two years at Coppermine, Frobisher and Port Hardy by upper air station personnel for the Department of Mines and Technical Surveys, this program continued to be very successful in providing seismic data on a regular basis.

Joint Arctic Weather Stations—The regular meteorological program at each of the Joint Arctic Weather Stations—Alert, Eureka, Isachsen, Resolute and Mould

Bay—consisted of eight synoptic weather observations, two upper wind observations using pilot balloons and two complete upper air observations per day. At Alert, Eureka, Isachsen, and Mould Bay, the program was increased by hourly and special surface observations during periods of unusually heavy flying activity, such as during the resupply airlift or when aircraft were operating in the vicinity in support of other scientific expeditions. At Resolute, hourly and special surface weather observations were carried out on a year-round basis.

Additional scientific programs at these stations included measurements of radiation, sea ice thickness, observations of snow temperature gradient and the physical characteristics of snow both surface and profile, observations of aurora, and measurements of soil temperatures.

Communications at Alert, Eureka, and Isachsen were improved by the installation of low frequency radio equipment, additional radio frequencies and single side-band radio equipment; similar improvements are scheduled for Mould Bay.

Pacific Weather Ships—The two weather ships CCGS *Stonetown* and *St. Catharines* maintained continuous operation at ocean station PAPA throughout the year. From these platforms, both surface and upper air meteorological reports as well as oceanographic and related information were obtained.

Ice Observing—During the year chartered aircraft flew 2,550 hours of aerial ice reconnaissance over the Eastern Canadian seaboard, Arctic and sub-Arctic areas, the Hudson Bay route to Churchill and inland waterways including the St. Lawrence Seaway, the Great Lakes, Lake Athabasca and Great Slave Lake.

Ice observers carried out both shipboard and aerial ice observing from Canadian Coast Guard icebreakers on the Eastern Canadian Seaboard and in both the eastern and western Arctic.

Most of the chartered aircraft were equipped with airborne radar and studies are in progress to find a more suitable type of radar for this operation.

All chartered aircraft on the Eastern Seaboard used Decca Navigation equipment to provide accurate positions. In other areas a selected aircraft was equipped with Doppler navigation equipment and with an improved compass system to determine the most effective navigation equipment for ice reconnaissance. Results were very encouraging and it is planned to extend the use of this navigation equipment to other areas.

Meteorological Instrumentation

This program provides for the design, development, evaluation, installation and maintenance of instruments used in the observational, climatological and research programs.

Surface Instruments—Design and development work was carried out on instrument clocks, wind recording systems, thermometers, daylight ceilometers, transmissometer systems, digital altimeter systems, automatic weather stations and specialized equipment for shipboard use.

Upper Air Instruments—Site surveys were made at all locations where the new GMD-2 rawinsonde equipment was to be installed.

Performance tests of the electrolytic hydrogen generator were sufficiently satisfactory to order the first ten units to be installed at field stations.

Climatological Instruments—An unattended hydrometeorological station prototype was developed to transmit information on temperature and precipitation. In addition, specialized instruments were under development for Lake research, and for microclimate studies for forestry and agriculture.

Research Instruments—Improvements were made in instruments for tether-sonde, wind-wave buoy and other specialized research projects.

Weather Radar—C-Band radars were installed at Halifax, Toronto, Winnipeg and Edmonton. Proof testing, which revealed several technical deficiencies, was carried out.

Arrangements were made for the installation, at the Meteorological Research Site, of a C-Band research radar. This is to be a transportable system using trailers to house the electronic and supporting components.

An order was placed for radars to perform weather surveillance and high level wind finding functions on the two new west coast weather ships.

Communications

The meteorological teletype system, with approximately 55,000 miles of circuitry served 352 stations with 534 connections.

The weatherfax system served 81 stations equipped with 98 connections over 13,600 miles of facsimile network.

Auto-Call, an automatic system of calling each station in sequence, was installed on all 100-series teletype circuits.

Forecasting

The forecasting organization has three distinct levels of operation. At the Central Analysis Office (CAO) at Montreal, the broad scale hemispheric features of weather patterns are charted and, assisted by a high speed computer, are analysed to derive forecast patterns for the time ranges in the future. At the next level, the Weather Centrals, using the CAO output, undertake more detailed analysis and derive forecast parameters for their areas of responsibility. Finally, the Weather Offices, operating within the guidance provided by the CAO and the Weather Centrals, produce forecasts tailored and distributed to meet the requirements of all users. During the year, extensions were made in the operational numerical weather prediction program carried out by means of the electronic computer.

Aviation Forecasts—Weather forecasts for aviation were prepared several times a day for aerodromes and aviation regions covering most of Canada. Designed for short and medium range aircraft, civil and military, these forecasts were distributed to users throughout Canada and the United States as required. For long-range and high altitude flights over Canada, including the Arctic, area forecasts prepared at the high level forecast centre in Montreal were issued in chart form and distributed by facsimile. Area forecasts in chart form were exchanged with the United States to cover routes to Europe, Asia, Honolulu, Central America, the Caribbean and the United States.

Aerodrome forecasts were prepared for international aerodromes and distributed to Europe, Asia, Central America and the Caribbean.

Special aviation forecasts were prepared for Royal flights, military exercises,

aerial ice surveys, Arctic flights, air races, glider meets, and other operations not served by routine forecasts.

Public Forecasts—Weather forecasts were issued for all populated areas of Canada and were provided to the general public by radio, television and the press. During the year, the period covered by the early morning forecast was extended to include the next day and an outlook for "the day after tomorrow" was added to the forecasts issued in late afternoon and evening.

Marine area forecasts were issued for coastal waters and inland waterways, in some areas on a seasonal basis, and were distributed to shipping primarily through the marine radio stations operated by the department. Forecasts for the coastal waters of the western and central Arctic were issued on a scheduled basis instead of "on request", because of the increase in marine operations in the area.

Special Forecasts—General forecast programs were supplemented by special forecast services to meet the particular needs of agriculture, forestry, industry and government. These included frost and wind forecasts for fruit growers in the Okanagan, Niagara and Annapolis areas, for tobacco growers in southern Ontario and special advice for agriculturists in southern Ontario and the Maritimes during harvesting operations.

Throughout the growing season agricultural weather forecasts were provided to Alberta farmers as a co-operative effort of the provincial Department of Agriculture and the weather office in Edmonton.

A somewhat similar co-operative program for a more restricted area in Saskatchewan was provided jointly by the Saskatchewan Department of Agriculture and the weather office in Saskatoon. A forestry weather advisory unit was established at Vancouver to provide professional advice to the British Columbia forest products industry.

During the winter months, special snow forecasts for mountainous regions of British Columbia were introduced for use by travellers, transportation agencies, resort operators, and skiers, and advice was provided for avalanche control. Special snowfall forecast programs were also inaugurated in southern Ontario and Quebec for the benefit of utilities and transportation agencies.

Warnings were issued whenever hazardous conditions such as freezing rain, heavy snow or rain, blizzards, gales and severe cold were expected to endanger life and property. Marine warnings were issued for coastal waters when dangerously high winds were expected. Warnings covering weather of special concern were relayed directly to conservation and civil authorities, public utilities and transportation interests and were also widely distributed through the press, radio and television.

Ice Forecasts—Ice forecasts were provided for marine operations in the Gulf of St. Lawrence, Newfoundland and Labrador coastal waters, Hudson Strait and Hudson Bay for general marine navigation, and in Arctic waters when shipping was engaged in the annual resupply of weather stations and other northern sites.

Climatology

Climatological operations included the collection, quality control, processing, mapping and publication of observed data for compilation of statistics and analysis of climatic conditions. In addition to the output of the regular observing stations,

over 2,000 climatological stations reported a variety of meteorological elements on a daily basis.

During the year over 3,000 requests for climatological information were answered and, in addition, work continued on a number of projects to provide government agencies, industry, aviation, etc., with specialized statistical information.

Seven professional personnel were seconded to other government departments to conduct work in applied meteorology and climatology relating to the special fields of interest of these departments.

Climatological Research—Bioclimatological studies relating to agriculture and forestry were carried out in co-operation with the Guelph Agricultural College, the Ontario Research Foundation and the federal Department of Forestry.

Recently computed normals, averages and extremes of climatic data for northern Canada were prepared for publication. A statistical study of the severity and duration of sub-zero weather in Canada and a study of winds and blowing snow in the Canadian Arctic were published.

Hydrometeorology—Studies were undertaken in three main areas of interest: (a) meteorological factors affecting flood flows and the design of major river structures; (b) Great Lakes investigations relating to water levels and watershed areas and (c) storm analysis and data control. In addition, several other studies, including the field program at the Douglas Point nuclear generating station and the winds, waves and erosion study at Point Pelee were undertaken.

Physical Research

Air Pollution and Turbulence—Research on air pollution and turbulence conducted in co-operation with the Department of National Health and Welfare; Atomic Energy of Canada Limited; the provincial health departments of Alberta, Saskatchewan, Manitoba, Ontario, Quebec, New Brunswick and Nova Scotia; the Ontario Research Foundation; the St. Clair River Research Committee; and the cities of Hamilton and Vancouver continued throughout the year.

Precipitation Physics Project—The purpose of this project is to investigate the physical mechanisms of precipitation production and to provide an assessment of the effect of silver iodide cloud seeding by aircraft over relatively flat terrain. Analysis of the data collected in the Rouyn-Noranda area of Quebec during the summer seasons of 1959 through 1963 began during the year.

Alberta Hail Project—The purpose of this project is to increase basic knowledge of the causes of hail and to develop means to tame these destructive storms. This is a joint project of the Meteorological Branch, the National Research Council and the Alberta Research Council operated by the Storm Weather Research Group of McGill University with assistance from the supporting groups and the RCAF. The Meteorological Branch supported the project through a contractual arrangement with McGill University and, in addition, provided special upper air soundings at Calgary and other specialized instrumentation such as tethersondes which provided temperature profiles to heights of 1,800 feet. The large volume of data collected during the hail season was subjected to detailed analysis from which a number of reports have been published.

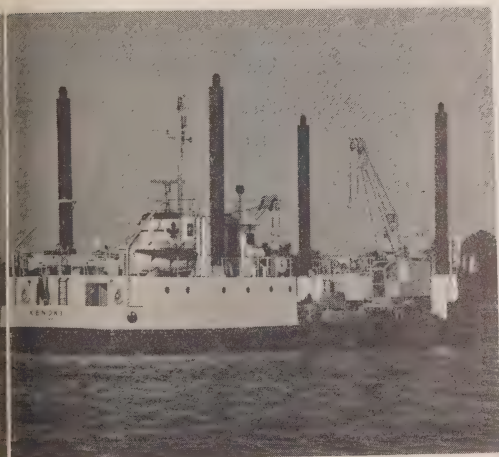
Cloud Physics and Atmospheric Electricity—Two new projects were com-



Lock 34, Fenelon Falls, Trent Canal system.



Lock 25, Lakefield, Trent Canal system.



CGS *Kenoki*, christened at Prescott, Ont., August 15, 1914.



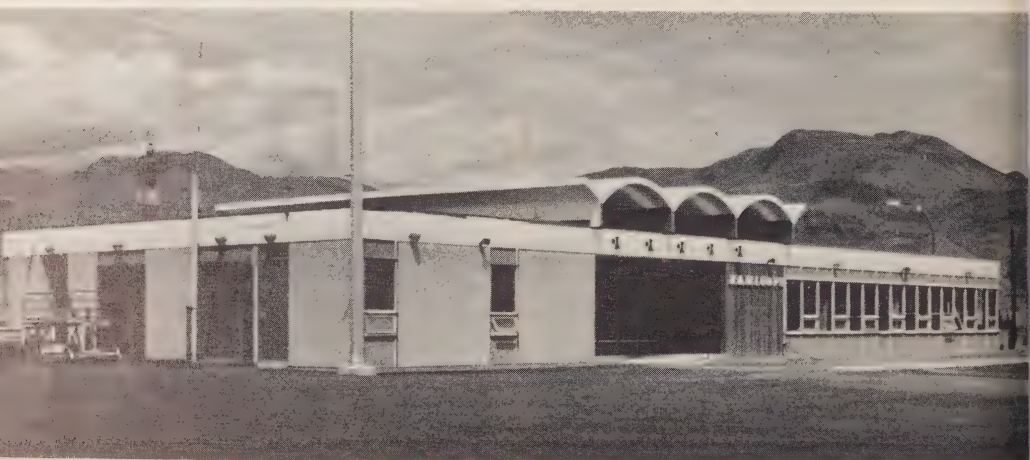
Peterborough lift lock, Trent Canal system.



Lock 42, Couchiching, Trent Canal system.



Sault Ste. Marie air terminal, officially opened May 23, 1961



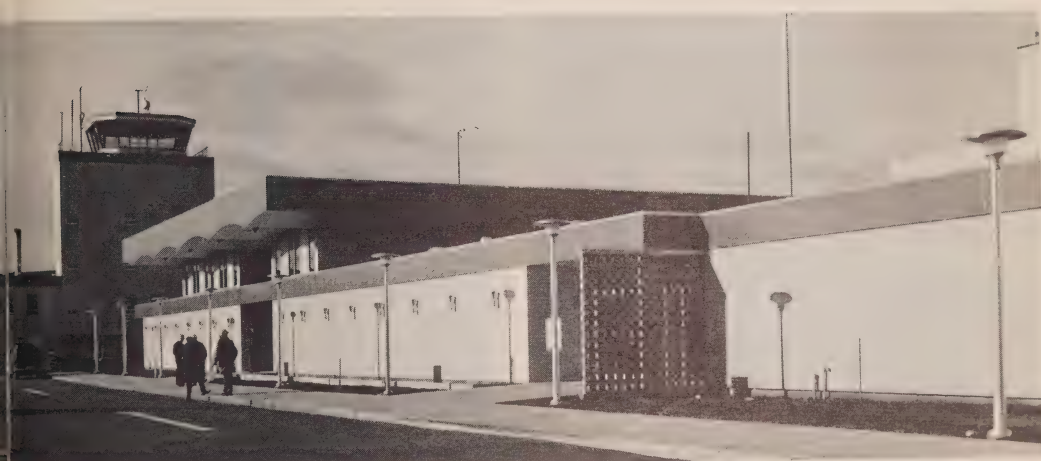
Kamloops air terminal, officially opened August 15, 1961



SPACE-AGE PUFFBALL—95-foot dacron cover for the antenna on the Department's communications satellite ground station near Mill Village, N.S., is neatly folded (1), mushrooms



Victoria air terminal, officially opened August 14, 1964.



Grethead air terminal, officially opened December 9, 1964.



Radome is pumped in (2), then sags over edges (3), but ends up as a tight balloon (4). Filling of the radome took place early in November 1964.





Search and rescue cutter CCGS *Spinaker*



CCGS *John A. Macdonald* at the site of a scientific expedition in Viscount Melville Sound during 1964 Arctic ice-supply operations.



A departmental supply convoy at Cape Dyer, Baffin Island. In the convoy are CCGS *John A. Macdonald*, *Narwhal*, *Auk*, and *Gannet*, chartered tanker *Jose*, *Simard* and chartered freighter *Federal Pioneer*.



Flight locks 28 and 29, Burleigh Falls—Trent Canal system

menced during the year. These were a pilot study into the dispersal of supercooled fog and a preliminary survey of lightning as a cause of forest fires.

Ozone—The network of stations taking surface ozone observations was extended to five locations, using Dobson spectrophotometers. Research continued on the analysis of data obtained from the surface observations and from the ozonesondes at selected sites.

Radiation—During the year the observing network was expanded and updated. Several experimental and instrument development projects were undertaken, including a project to transfer hourly radiation data, earlier recorded at several Canadian stations, to punched cards, for computer processing.

Joint Wind-Wave Study—The Meteorological Branch joined with the department's Marine Services, National Research Council and the Bedford Institute of Oceanography, in a major assault on the effects of wave conditions in the Great Lakes and Gulf of St. Lawrence on ships' structures.

Dynamic Research

Re-programming of basic numerical weather prediction routines used at the Central Analysis Office was completed. Research continued with the use of specially prepared computer programs in studies of latent heat influences on development of storms, stratospheric studies and long period atmospheric and geophysical oscillations.

Synoptic Research

A general multidimensional joint frequency distribution program was completed during the year. This system is expected to be very useful in the study of historical hourly weather data in respect to the joint effect of many controlling parameters on a weather element of interest. Arrangements were made to use this system in a computer study of the local variability of snowfall in the area of Metropolitan Toronto. Other studies were undertaken during the year such as study of Huron-Michigan Lake levels in relation to basin precipitation and a study of Lake Ontario surface temperatures.

Scientific Development and Evaluation

Approximately a dozen projects were active during the year to develop techniques for use in the Canadian weather service forecasting system.

Meteorological Training Program

Nine meteorologists were graduated from the Masters' program and posted into operations during the year. Twenty-one Meteorological Officers graduated from the in-services training program in 1964. Meteorological training for those employed in the observing network in Canada continued at the Air Services Training School, Ottawa, the Federal Electric Corporation Meteorological School at Streator, Illinois, Meteorological Headquarters and Regional Offices. Training in forecast office operations and advanced training for meteorological technicians was provided at the Air Services Training School. A special course on the Canadian Weather Service Forecasting System was provided to field management officers.

Meteorological Services to National Defence

Military meteorological requirements within Canada and abroad were met by special co-operative arrangements with the Department of National Defence. Professional personnel, technical advice, forecasting and climatological services, weather communications, research services and meteorological equipment were provided to assist National Defence in the operation of weather facilities in Canada, on HMC ships and in support of Canadian Forces overseas.

World Meteorological Organization

Participation in the World Meteorological Organization included representation on many international commissions, committees and working groups. Two staff members served as Presidents of WMO Technical Commissions. Active contribution was made to WMO technical assistance missions overseas.



CCGS *Ernest Lapointe* icebreaking in the St. Lawrence River.

MARINE SERVICES

Aids to Navigation

Progress continued in converting oil-burning lights to automatic types. Of the 3,447 lights in operation, 699 are manned where sound, radio or light signals require daily attendance.

Helicopters based on the Canadian Coast Guard supply ships and at Agency Depots are becoming increasingly invaluable in servicing unwatched lights, reducing the period that lights are out of order. The first off-shore lighthouse with a heliport, at Prince Shoal, P.Q., was successfully operated all year round.

Approximately 10,000 buoys were maintained on coastal and inland waters, of which 1,582 were major buoys equipped with lights, sound devices or both light and sound devices. There were also nearly 5,000 minor unlighted shore-based beacons, dolphins, stakes and other markers. In areas where navigation closes for the winter, buoys are lifted and stored and, in certain areas, as required, specially designed ice buoys are placed for the benefit of late shipping. Buoys are maintained on charted positions throughout the shipping season, and maintenance and constant checking of their positions are carried out by masters and officers of departmental vessels and inspecting officers from the District Marine Agencies.

Construction

The design of a new light pier at Brule Bank in the St. Lawrence River, which will replace an obsolete and unrepairable upper pier of the dual range lights, was completed.

Investigation of the foundation for the fixed light piers in the St. Lawrence River between Montreal and Portneuf, P.Q., continued. These fixed light piers will replace a number of buoys.

Survey and engineering for a slip to accommodate the tender for Amherstburg, Ont., were completed and a contract was let.

Twenty new dwelling units, eight fog alarm buildings and seven major lighthouse towers were constructed by contract under the supervision of departmental engineers, to either replace obsolete lightstation buildings or to provide additional dwelling accommodation.

The new Agency wharf at Charlottetown, P.E.I., has been completed and construction of new Agency stores and office is expected to begin in the summer of 1965.

The new Agency Depot buildings at St. John's, Nfld., are occupied, and construction of new Agency buildings, shops, stores and offices is under way at Prince Rupert, B.C., scheduled for occupancy in September 1965.

A site has been chosen at Colwood in Esquimalt Harbour, B.C., for a combined Transport-Mines and Technical Surveys establishment.

Studies for the establishment of a new Marine Depot at Sault Ste. Marie, Ont., have been carried out.

In addition to these major projects, a number of new minor lighthouse towers were constructed and the regular repair program was continued.

Electrical and Mechanical Equipment

Electrification of lightstations continued, with diesel-generated power being installed where commercial power is not available. Improved types of lights, particularly acrylic lens, are being purchased for replacements. The use of mercury vapour lights is now considered a success, and trials of various sized lamps in various optics are being carried out at the Prescott Marine Depot photometric laboratory. Mercury vapour lamps with additives for producing more white light and a rapidly flashed Xenon light of English manufacture are being tested.

The Pelee Passage fog alarm in Lake Erie is now radio controlled from South East Shoal on a regular basis and interest in remote control of fog alarm stations continues.

A fog detector which measures fog with the aid of an electric light beam and a photo-electric cell is ready for trial in Halifax Harbour.

The increasing number of new lightstations has greatly increased mechanical maintenance work. However, new facilities provided by Agency workshops, more vehicles and electrification have made it possible to carry out the work without any increase in personnel.

For instance, landing supplies has been facilitated by using small tractors fitted with trailers, thus releasing the supply vessel for the next station much more quickly than before. Also, with new trucks and station-wagon type vehicles many shore-based stations are being serviced which were previously serviced by ship.

A considerable number of new buoys were established throughout the navigable waters of Canada, particularly in areas of heavy small boating activity. For the purpose of reducing manufacturing costs, some of the older types of buoys were re-designed, and plastic buoys are still being tested.

Publications

Requests for the weekly *Notices to Mariners* increased during the year, some 5,000 copies now being required for distribution. The scope of the Notices has been widened and include such information as changes in aids to navigation, nautical regulations, newly discovered hazards, and lists new hydrographic charts and pub-

lications. Information from these Notices is used by the U.S. Coast Guard, British Admiralty and the Royal Canadian Navy in their marine publications.

The 1965 edition of *Lists of Lights and Fog Signals* was again published in four volumes—Newfoundland, Atlantic, Inland and Pacific.

The compilation of the publication *Information Concerning the St. Lawrence Waterway and Connecting Channels from Anticosti Island to the Lakehead* was undertaken during the year.

Canals

Pleasure boat traffic on the canals continued to increase, particularly on the Trent which had a total of 108,747 lockages compared with 99,488 the previous year. Freight traffic through the Canso canal again increased, with a total of 1,345,287 tons, an increase of 138,705 tons over last year.

The rehabilitation program for the Trent Canal system continued, with the new Swift Rapids lock nearing completion. The third and final mechanical phase for the Peterborough lift lock was started, and the first phase of a three-year plan for the Kirkfield lift lock, covering the replacement of steelwork, was completed.

Work on the Rideau Canal included the completion of a concrete fixed bridge at Kilmarnock lock station and erection of a new watch-house. Major renovations to the Canal blockhouse at Merrickville lock station were carried out, and new lock gates were built for Smiths Falls, Jones Falls and Kingston Mills locks.

On the Carillon Canal a tie-up wharf at the lower lock entrance was almost completed and the parking area and access road were paved. New hydraulic mechanisms were installed on the Ste. Anne Canal. On the St. Ours Canal the guard gates at the upper entrance were replaced and a new paved road from the lock to the highway was constructed. Maintenance work was carried out on the Chambly Canal.

Detailed engineering work, including field surveys, tender drawings and specifications and model studies for a new lock at Burleigh Falls on the Trent Canal was started, and initial field surveys for a new lock at Kingston Mills on the Rideau Canal were made. Field studies of major rehabilitation requirements on the Chambly Canal, and design and tender drawings for new lower entrance walls on the Ste. Anne Canal were completed.

Harbours and Property

Harbour Commissions—In November 1964 the new *Harbour Commissions Act* received Royal assent and arrangements were completed to bring the Act into force on April 1, 1965, on the Fraser River, replacing the *New Westminster Harbour Commissions Act* of 1913. It will be known as the Fraser River Harbour Commission and the number of commissioners will be increased from three to five. Under the new Act there will be greater uniformity of administration by all harbour commissions.

Revenue earned by harbour commissions in 1964 amounted to \$7,055,000.

Public Harbours—In March 1965, the harbour at Corner Brook, Nfld., was proclaimed a public harbour. There are now 313 such public harbours, of which 127 are under the supervision of harbour masters appointed by the Minister to enforce the Public Harbour Regulations.

Harbour dues collected totalled \$476,767, an increase of 18.5 per cent over the previous year.

Cargo handled in the ten major public harbours in 1964 totalled 51,234,000 tons. Of this total, Seven Islands had 16,603,000 tons, Baie Comeau, 8,286, Sault Ste. Marie, 5,694, Sorel, 4,378, Sarnia, 3,817, Sydney and North Sydney, 3,747, Port Alfred, 3,330, Victoria, 2,696, Havre St. Pierre, 1,371, and Prince Rupert, 1,312.

Wharves—Of some 3,000 wharves, piers and breakwaters under the administration of the Department, 479 are in charge of wharfingers. Revenue from wharves amounted to \$1,868,841, an increase of \$650,632 over the previous year.

Water Lots—Since the opening of the St. Lawrence Seaway in 1959, the Soulages Canal has not been used, and, effective March 17, 1965, the entire Canal property was transferred to the Quebec Roads Department for administration and control.

At the end of the fiscal year there were 2,171 water-lot leases and licences in effect, an increase of 86, and revenue totalled \$482,877, an increase of \$97,308 over last year.

Steamship Inspection

Ship inspections carried out included 195 new ships completed in Canada, five converted or reconditioned, three built outside Canada for Canadian registry, and five transferred to Canadian registry. In addition, 1,762 Canadian registered vessels and 42 registered elsewhere, totalling 1,721,152 gross tons, were inspected. Of this, 466 were passenger ships totalling 235,278 tons.

Fifteen accidents and three fatalities that occurred during the year in connection with loading and unloading ships were investigated.

Of 4,410 inspections of ships' tackle, 409 cases required repairs, adjustments or testing of cargo handling gear.

At Clarendville, Nfld., work on the main haul-out section of a 500-ton lifting capacity marine haul-out was completed and handed over to the Newfoundland Shipyards Limited for operation. The second phase of this project, construction of the side transfer system and fitting-out wharf, began.

Construction of a 75-ton lifting capacity marine haul-out at Lewisporte, Nfld., was begun and about 80 per cent of the work completed.

Lifejackets

The lifejackets research project to develop the most efficient type of lifejackets continued in co-operation with the Canadian Government Specifications Board.

Pollution

Water—Helicopter patrols over the St. Lawrence River, Lakes Huron and Erie, and Georgian Bay were carried out during the navigation season to check on pollution of the waters by oil. Eight successful prosecutions for violations of the Oil Pollution Prevention Regulations were carried out.

The problem of water pollution of the Great Lakes and their connecting waters caused by the discharge of ordure and garbage from ships was discussed with officials of the Department of National Health and Welfare and the Ontario Water Resources Commission. A letter outlining the proposed Ordure and Garbage Pollution Prevention Regulations was distributed to the industry for comment.

Water Safety

Recommended safe load and capacity plates issued to individuals during the year totalled 10,789, and 27,591 were issued in bulk quantities to boat manufacturers and distributors.

Three hundred and ten thousand copies of the booklet, *Safety Afloat*, were distributed to the boating public, boating safety equipment was displayed at a number of exhibitions, and departmental officers gave address on water safety at various boating functions.

Marine Engineering Training and Examinations

Under the Department's marine engineer training scheme, two trainees completed their four-year shipyard training, obtained fourth class certificates of competency and joined the Canadian Coast Guard fleet as junior engineer officers.

Since the inception of the scheme, eleven men have joined the Coast Guard fleet and five of these have obtained second class certificates of competency of United Kingdom validity.

Three trainees are now undergoing training in Canadian shipyards. In June they were given a four-week course designed to supplement the evening courses they take at local universities and to co-relate the application of the course to practical marine work.

Candidates for certificates of competency as marine engineers totalled 1,042, of which 831 were successful and 209 received partial passes.

Revenue

Revenue collected, including inspections services and examination fees, totalled \$203,033.

Ship Registration

Small vessels exempt from registration and licensed under the *Small Vessel Regulations* totalled 47,478, making a total of 569,054 issued throughout Canada at December 31, 1964. During the same period, 1,573 vessels were added to the Canadian registry and 651 removed, making a net increase of 922. At the end of December, there were 23,718 vessels totalling 2,958,147 gross tons registered in Canada.

The Registrar General of Shipping and Seamen in the United Kingdom was supplied with information on approximately 8,775 separate transactions, involving first registry, re-registry, transfer and transmissions of ownership, mortgages, and changes in name, together with details of all vessels registered during this period. This information is used in compiling the *Mercantile Navy List and Maritime Directory*, which shows particulars of vessels registered in the Commonwealth.

Revenues from various types of registry transactions totalled \$16,203.75.

Live Stock Shipments

During the 1964 navigation season, 9,047 head of live stock were shipped from Montreal, P.Q. and Saint John, N.B., to ports abroad under the supervision of the department's Inspector of Live Stock Shipments on ships fitted as prescribed by the Live Stock Shipping Regulations.

Pilotage

There were 365 licensed pilots engaged in the nine districts for which the Minister is the pilotage authority—Sydney, Bras d'Or Lakes, Halifax, Saint John, Quebec, Montreal, Cornwall, British Columbia, and Churchill.

They performed 37,641 pilotages inward or outward and 12,300 movages, grossing \$6,046,160.00 in fees.

Pilotage in the districts of Cornwall to Kingston, Port Weller to Sarnia, and the Lakehead and St. Mary's River is carried out as a joint operation between Canadian and United States authorities.

Cornwall to Kingston—During the 1964 navigation season, 21 licensed Canadian pilots performed 2,642 pilotages from Cornwall to Kingston, netting \$333,121.70 in pilotage fees.

Port Weller to Sarnia—The 33 pilots employed during the 1964 navigation season made 3,232 pilotages between Port Weller and Sarnia, netting \$568,267.60 in fees.

The Lakehead and St. Mary's River—During the navigation season three pilots were employed to conduct ships through the St. Mary's River and into ports on Lakes Huron, Michigan and Superior. The net amount of pilotage fees was \$58,471.98.

Labrador—Two pilots were employed by the department to assist ships in and out of Goose Bay.

Marine Casualties

Twenty-one investigations into marine casualties were made under the *Canada Shipping Act*, one of which was a formal inquiry.

Royal Commission on Pilotage

The Royal Commission on pilotage, appointed in November 1962 to enquire into and report upon the problems relating to marine pilotage in Canada, continued its hearings during 1964.

Masters, Mates and Seamen

Nautical examinations held during the year totalled 3,249. Certificates issued included 1,020 master, 75 first mate, 59 second mate, 74 able seamen, 15 ships' cook, 375 lifeboatmen, and 288 certificates of qualification for the Great Lakes. Examination fees collected totalled \$15,802.

An amount of \$237.00 was expended for the repatriation of Canadian seamen, and \$2,283 was deposited with the Receiver General of Canada for fines and deserters' wages.

During the year, there were 36,692 engagements and 38,196 discharges of seamen at 107 Canadian Ports.

St. Lawrence Ship Channel

The fleet of five survey and inspection vessels was engaged throughout the navigation season on channel maintenance and improvement in the St. Lawrence River below Montreal, and two maintenance units worked in the non-canal reaches above Montreal.

Five field units collected basic hydraulic data, including water levels, current velocities and soundings, in the upper tidal reaches between Trois-Rivieres and Sorel. Continuous measurements over 24 and 48-hour periods were taken to determine tidal characteristics. In addition, up-river reaches were measured and some shore erosion observations were taken.

Work carried out for the National Harbours Board included maintenance surveys and sweeping in Montreal Harbour, at all berths in Trois-Rivieres Harbour and in the St. Charles River and Wolfe's Cove in Quebec Harbour.

Construction—Of the two-year 1964 contract for 800-foot widening between Batiscan and Cap a la Roche, Batiscan Channel and Curve was 98 per cent completed and 54 per cent was completed between Batiscan Traverse and Cap Levrard Curve and Channel.

The 1962 contract, part of the 800-foot widening program between Trois-Rivieres and Cap Charles, was completed and the increased width was available to navigation.

Canadian Coast Guard

Three new ships were added to the fleet during the year: CCGS *Kenoki*, a buoy tender based at Prescott, Ont., for use in the St. Lawrence Seaway and the Great Lakes area; and two 70-foot search and rescue cutters, *Spray* and *Spindrift* for use in the Great Lakes in summer and where required during the winter. In addition, two crash boats renamed *Mallard* and *Moorhen* were taken over from the Royal Canadian Air Force and are used for in-shore rescue purposes from a base at Kitsilano, B.C.

The fleet consists of 189 craft of the following types: full icebreakers, 10; light icebreakers, supply and buoy vessels, 8; lighthouse supply and buoy vessels, 11; special Arctic service vessel, 1; northern supply vessels, 6; northern service depot ship, 1; St. Lawrence Ship Channel vessels, 4; lightships, 3; weatherships, 3; Mackenzie River shallow draft vessels, 4; Great Lakes limnology and meteorological research, 1; shore based lifeboats, 3; Agency tenders, 10; rescue cutters, 10; steel landing craft, 2; landing craft and barges at Agencies, 71; steel landing craft and barges at northern sites, 41.

These ships are under the administration of the 11 Marine Agencies located throughout Canada and of the St. Lawrence Ship Channel.

Northern Operations

The annual Arctic resupply operations delivered 118,920 short tons of cargo to 67 ports of call. Existing aids to navigation were serviced throughout the area, a number of new ones were established, and direction finding stations were calibrated.

The annual Eastern Arctic patrol was conducted by medical and administrative officials of the Departments of National Health and Welfare, and Northern Affairs in the CCGS *C. D. Howe*.

In the Foxe Basin and along Baffin Island coastal supply areas, ice conditions were relatively good. At Resolute the break-up occurred about one week later than usual. Throughout Hudson Bay and Strait conditions were normal.

CCGS *Camsell*, on her passage east in July, was held up several days off Point Barrow until assisted by the United States Coast Guard icebreaker *Northwind*. The first supply ship into Cambridge Bay was over two weeks later than usual. An attempt

by the CCGS *John A. Macdonald* to pass through McClure Strait to support these operations had to be abandoned when impenetrable ice was encountered off Melville Island.

Merchant ships in the Churchill grain trade were assisted by icebreakers, both in the Hudson Bay and Strait. The ice operations office at Churchill was in operation from July 16 to October 16, providing an advisory service for shipping throughout this period. A total of 41 ships loaded 21,644,773 bushels of grain at Churchill, and three tankers discharged oil cargoes in the port.

Ice conditions on the Churchill route were severe, the first ship arriving on August 1, five days later than the earliest ship of the 1963 season. The last vessel of the season left Churchill on October 11, nine days earlier than last year.

Winter Icebreaking

The ice operations office at Sydney, N.S., commenced its fifth season on December 7. Throughout the winter ice conditions were generally average. From December 1, 1964 to May 15, 1965, passages through Cabot Strait totalled 1,178, an increase of 54 per cent over the previous year.

Icebreaking assistance was given to 519 ships, the remainder proceeded on routing instructions from the ice operations office.

For the second time in history the Miramichi River was opened to shipping and 15 ships were escorted in and out of the River by Canadian Coast Guard icebreakers from December 6 to April 15.

A number of vessels were freed by icebreakers and on seven occasions icebreakers took vessels in tow in emergencies. In addition, a considerable number of fishermen and sealers were assisted to open water from iced-in regions. Imports and exports totalled 7,400,000 tons for the season. Half of this tonnage was iron ore concentrates. The remainder was cargo of all types, including newsprint, aluminum, grain and manufactured goods.

The Department's publication, *Guidance to Merchant Ships Navigating in the Gulf of St. Lawrence in Winter*, was widely distributed throughout the marine industry.

Four icebreakers opened a channel to Montreal upper harbour on February 23. The channel was maintained throughout the winter, with the exception of local ice jams in the Varennes, Vercheres, Sorel and Lake St. Peter reaches. These reaches were re-opened by icebreakers, preventing any flood threat.

Winter water levels in Montreal harbour reached an elevation of 15'10" above chart datum on January 20, then gradually declined following ice cover formation in Laprairie Basin.

In the Saguenay River, two icebreakers completed operations on March 27. Icebreaking above Montreal was extended as far as Cornwall. CCGS *Ernest Lapointe* entered St. Lambert lock on March 29.

Hamilton Inlet and Lake Melville, Labrador

An experimental probe into Lake Melville was attempted by the heavy icebreaker CCGS *John A. Macdonald* during the winter. The vessel reached a point at the eastern end of Lake Melville, 24 miles inland from Rigolet, on February 20, then returned to the open sea. This was followed by a second probe by CCGS *d'Iberville*, which reached Goose Bay Narrows at the head of Lake Melville on May 23, 1965.

Great Lakes Research

CCGS *Port Dauphine* continued to operate for the Great Lakes Institute and for the Department's Meteorological Branch for scientific research purposes.

Weatherships

CCGS *Stonetown* and CCGS *St. Catharines* continued their patrols of ocean weather station *Papa*, 900 miles out in the Pacific, on an alternating basis.

Search and Rescue

Under the overall administration of the Royal Canadian Air Force, the Coast Guard rescue officers attached to the Rescue Co-ordination Centres at Halifax, Trenton and Vancouver, controlled the operations of the Coast Guard rescue cutters and provided the marine liaison for the search and rescue organization.

Volunteer rescue agents continued to increase in number, both in the Maritimes and on the Pacific Coast, as well as in the River and Gulf of St. Lawrence.

Coast Guard rescue officers again gave public addresses on water safety and maintained close liaison with the commercial fishing industry and with the pleasure boating public.

Training

Courses in navigation, with special emphasis on the use of modern electronic equipment were made available to Coast Guard officers by the Royal Canadian Navy. Twenty-two officers from East Coast Agencies attended these courses at Halifax.

Courses in marine weather observing were conducted at Quebec and Dartmouth, N.S., by instructors provided by the Meteorological Branch.

Skindiving training was carried out in Quebec by arrangement with a local training establishment.

The establishment of a training facility at Sydney, N.S. for officer cadets progressed. Buildings at the Point Edward Naval Base that were surplus to the requirements of the Department of National Defence were acquired and contracts let for their alteration to classrooms and living accommodation for some one hundred cadets. A director and other staff members were recruited and the Coast Guard College is scheduled to be opened in September 1965.

Interest in correspondence courses continued, particularly by engine room personnel. Enrolment totalled 197 and the number of certificates obtained increased by 56 per cent over the previous year.

Ship Construction

Five vessels were completed during the year, eight were under construction, and sixteen were in the design stage.

Completed were the tender *Kenoki* for service at Prescott, Ont.; two 70-foot search and rescue cutters, *Spray* and *Spindrift* for service in Central Canada; a bait vessel, *Arctica*, for the Department of Fisheries for service in the Newfoundland area; and a pilot boat for External Aid for service in Barbados, British West Indies.

Under construction were two weatherships to maintain the Pacific Ocean weatherstation; a cable repair and icebreaking ship, *John Cabot*, for service on the

East Coast; an icebreaker for service in the Maritimes and Northern areas; a supply and buoy vessel to replace the *Chesterfield* and *Saurel* for service at Quebec, P.Q.; a ferry for Canadian National Railways service between Nova Scotia and Argentia, Nfld., and one for the Prince Edward Island ferry service; a pelagic fisheries vessel for the Fisheries Research Board for service on the East Coast.

A major refit and conversion of the rail car ferry, *Patrick Morris*, was carried out for the Canadian National Railways to enter service between North Sydney, N.S., and Port aux Basques, Nfld.

In the design stage were a tender for the Lakehead; an icebreaking supply and buoy vessel for St. John's, Nfld. and Gulf of St. Lawrence; a tender for Saint John River, N.B.; a tender for St. John's, Nfld., to replace the *Sea Beacon*; a replacement vessel for the *Safeguarder*; a replacement for the *Grenville*; a replacement for the *Frontenac*; a prototype supply vessel for Northern operations; a prototype search and rescue vessel for service on the East and West Coasts; a ferry vessel for CNR service between North Sydney, N.S., and Port aux Basques, Nfld.; three pilot vessels for service in St. John's, Nfld., Sydney, N.S., and Prince Rupert, B.C.; and two Department of Fisheries protection vessels, one for service on the East Coast and one for service on the West Coast.

Repairs

Under the supervision of the Ship Construction Branch, repairs totalling \$3,930,000 were carried out on departmental ships, and alterations and additions totalled \$1,340,900.

RAILWAY SERVICES

Canadian National Railways

Canadian National Railways operated at a deficit of \$38,725,904 in the calendar year 1964, compared with a deficit of \$43,013,517 the previous year.

Air Canada

Air Canada operated at a profit of \$1,405,575 in the calendar year 1964, compared with a profit of \$527,875 in 1963, a gain of \$877,700.

Prince Edward Island Ferry and Terminals

The deficit in the operations of this service for the calendar year 1964 totalled \$3,978,806, compared with \$3,352,677 in 1963, an increase of \$626,129.

In the fiscal year, payments made on ferry construction amounted to \$1,486,451, and dock construction totalled \$831,183 for Borden and \$28,227 for Cape Tormentine.

Vehicle traffic increased from 214,415 vehicles in 1963 to 237,560 in 1964; freight, from 735,355 tons to 906,985; and passengers, from 523,633 to 587,515.

Newfoundland Ferry Service

In addition to the regular North Sydney-Port aux Basques service, a freight service only is operated from North Sydney to various other Newfoundland ports as required by traffic conditions. Construction was started in 1964 on the terminal requirements and a vessel for a new vehicle and passenger service to operate to Argentina.

The deficit in the operation of this service amounted to \$11,086,937 during 1964, compared with \$8,572,936 in 1963, an increase of \$2,514,001.

Yarmouth, N.S. - Bar Harbor, Me., Ferry Service

Traffic handled by this service in 1964 consisted of 88,211 passengers, 25,886 cars, 3,147 trucks, and 803 other vehicles, compared with 90,195 passengers, 26,137 cars, 3,010 trucks and 751 other vehicles in 1963.

Supplemental Pension Allowances

Supplemental pension allowances payable by the Government of Canada to retired former Newfoundland railway, steamship and telecommunication employees amounted to \$195,000, compared with \$170,493 the previous year.

Victoria Jubilee Bridge

The revocation of the tariff of tolls on the Victoria Jubilee Bridge was approved by Order in Council, effective June 1, 1962.

As compensation to Canadian National Railways, a capital payment was made amounting to \$2,578,000 covering unamortized investment in the highway portion of the bridge, plus cancellation of a toll equipment contract.

Annual operating costs amounting to approximately \$875,000 were included in the agreement. The actual costs for 1964 amounted to \$843,902.

Great Slave Lake Railway

This line is expected to be mainly completed by December 31, 1966. Accountable advances for 1964-65 amounted to \$24,134,000, bringing the total advance to date to \$58,559,000.

FINANCIAL SUMMARY

Comparative Summary of Expenditures and Revenues for the Fiscal Years Ended March 31, 1964 and 1965

	<i>Millions of Dollars</i>		
	1964-1965	1963-64	Increase (+) or Decrease (—)
<i>Administration, Operation and Maintenance Expenditures</i>			
Departmental Administration	4.2	3.7	.5 (+)
Air Services	91.4	82.0	9.4 (+)
Marine Services	39.3	38.3	1.0 (+)
Railway and Steamship Services	93.8	97.1	3.3 (—)
Miscellaneous Services	152.6	134.5	18.1 (+)
General	2.4	.2	2.2 (+)
	<u>383.7</u>	<u>355.8</u>	<u>27.9 (+)</u>
<i>Capital Expenditures</i>			
Air Services	40.3	39.1	1.2 (+)
Marine Services	25.2	25.8	.6 (—)
Railway and Steamship Services	10.2	1.8	8.4 (+)
Miscellaneous Services	—	.4	.4 (—)
	<u>75.7</u>	<u>67.1</u>	<u>8.6 (+)</u>
TOTAL DEPARTMENTAL EXPENDITURES	<u>459.4</u>	<u>422.9</u>	<u>36.5 (+)</u>
<i>Revenues</i>			
Air Services	28.0	21.4	6.6 (+)
Marine Services	8.8	6.6	2.2 (+)
Railway and Steamship Services .....	.5	.5	—
Miscellaneous Services	43.2	2.6	40.6 (+)
	<u>80.5</u>	<u>31.1</u>	<u>49.4 (+)</u>

EXPLANATION OF INCREASES AND DECREASES

Administration, Operation and Maintenance Expenditures

Departmental Administration—The cost of departmental administration increased by \$0.5 million of which \$0.4 million was due to higher payroll costs.

Air Services—Reflecting in part the cost of operating new terminals and other new and expanded facilities as well as higher payroll costs, expenditures by Air Services were up by \$9.4 million. Civil Aviation Branch incurred expenditures of \$40.8 million compared with \$34.8 million the previous year. The Telecommunications and Electronics and the Meteorological Branches experienced increases of \$1.0 and \$1.0 millions respectively. General administration and the administration of the Construction Branch reported added costs of \$0.5 million.

Marine Services—All branches except Marine Operations, which incurred expenditures of \$23.1 million compared with \$23.2 million in 1963-64, contributed to the overall increase of a very nominal amount of \$1.0 million or slightly more than 2.5%. The various increases (in millions) were Headquarters and Agency administration \$0.1, Marine Works Branch \$0.3, Marine Regulations Branch \$0.5, and Marine Hydraulics Branch \$0.2.

Railway and Steamship Services—The amount required to meet the deficit of the Canadian National Railways was \$38.7 million compared with \$43.0 million the previous year. Payments to the C.N.R. due to the termination of collection of toll on the Victoria Jubilee Bridge were down \$3.0 million. During 1963-64 a payment of \$2.8 million was made to the C.N.R. as interest on the cost and expenses of construction of a rail diversion on the same bridge. There was no corresponding payment during 1964-65.

The above reductions were partly offset by increases of \$3.0 million in deficit on ferry operations, \$2.4 million in the subsidy for the construction of a railway to Great Slave Lake and \$1.3 million in subsidies under the Maritime Freight Rates Act.

Miscellaneous Services—Additional expenditures in this category included payment of \$27.1 million to the St. Lawrence Seaway Authority to cover the accumulated deficits of the Welland Canal for the years 1959 to 1964 and an increase of \$0.6 million in payments under the Freight Rates Reduction Act. There were reductions of \$8.0 million in the capital subsidies for construction of commercial and fishing vessels, of \$0.6 million in the payment to the St. Lawrence Seaway Authority to cover the operating deficits of entrusted canals and of \$1.1 million in steamship subventions for coastal services.

General—Refunds of amounts credited to revenue in previous years were \$2.0 million attributable mainly to the cancellation of the air route facility fee. Refund during 1963-64 were \$49,000. Of the former amount \$1.5 million was credited to aircraft landing fees which had been abated while collection of the air route facility fee was in effect.

Capital Expenditures

Air Services—Expenditures with respect to national airports were down by \$5.0 million. In addition to an anticipated decline, actual expenditures fell short of estimates as projects were deferred or failed to reach the expected stage of completion. The Telecommunications and Electronics Branch incurred increased expenditures of \$6.0 million of which \$5.7 million was attributable to the satellite communication system and station. The Meteorological Branch reported an increase of \$0.2 million.

Marine Services—Construction or acquisition costs for Aids to Navigation declined \$2.0 million and expenditures on the dredging of the St. Lawrence River Ship Channel dropped \$4.2 million. These were partly offset by increases in capital expenditures of \$2.7 million for the Canadian Coast Guard and \$2.6 million on canals under the jurisdiction of the Department of Transport. Of the latter amount \$2.2 million was due to additional expenditures on improvements to the Trent Canal System.

Railway and Steamship Services—Expenditures on construction or acquisition of ferry vessels and equipment accounted for \$8.0 million of the total increase of \$8.4 million.

Miscellaneous Services—Capital requirements for buildings and equipment with respect to canals entrusted to the St. Lawrence Seaway Authority were \$8,000. The corresponding amount in 1963-1964 was \$358,000.

Revenues

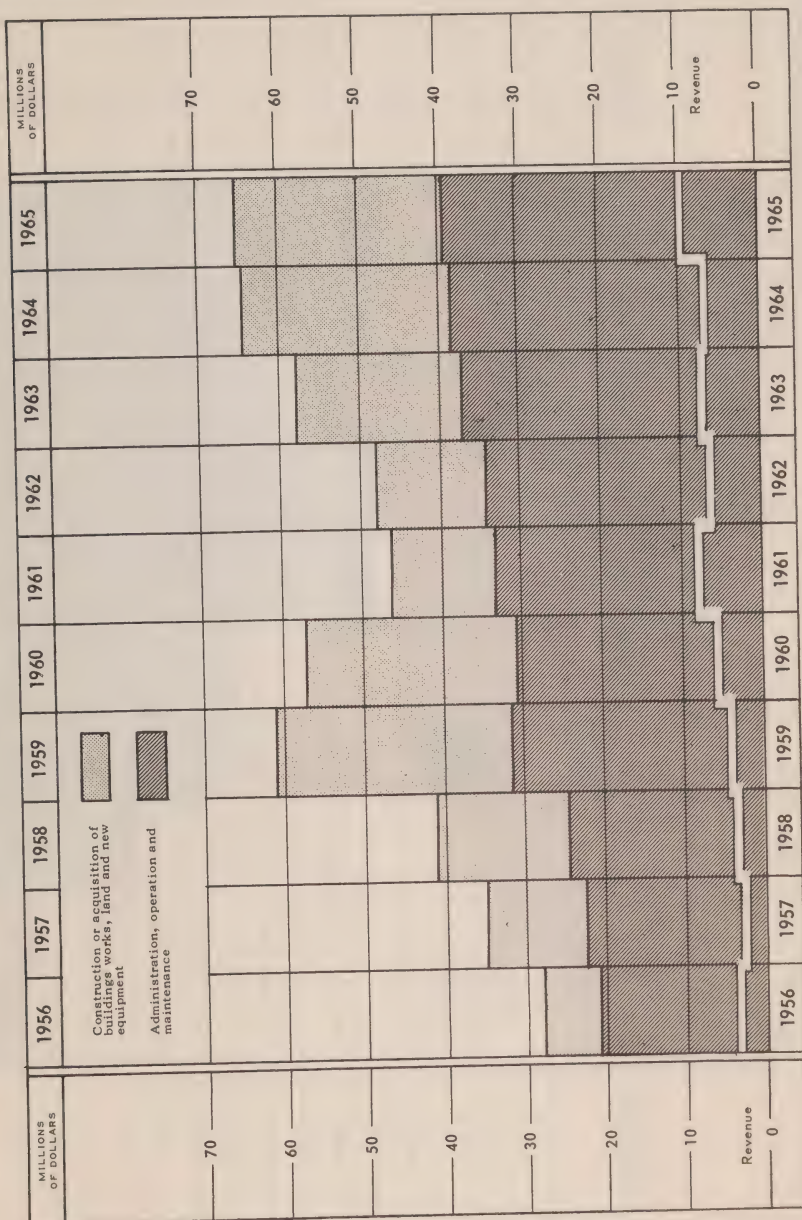
Air Services—Revenues of the Civil Aviation Branch were up \$5.5 million. Increased receipts from rentals and concessions were \$2.1 million. Landing fees rose by \$3.0 million, of which \$2.0 million was due to collection of landing fees which had been abated while the air route facility fee was in effect.

Amounts credited to revenue during the fiscal year 1964-65 and attributable to the operation of the Telecommunications and Electronics Branch were \$4.7 million compared with \$3.8 million in 1963-64.

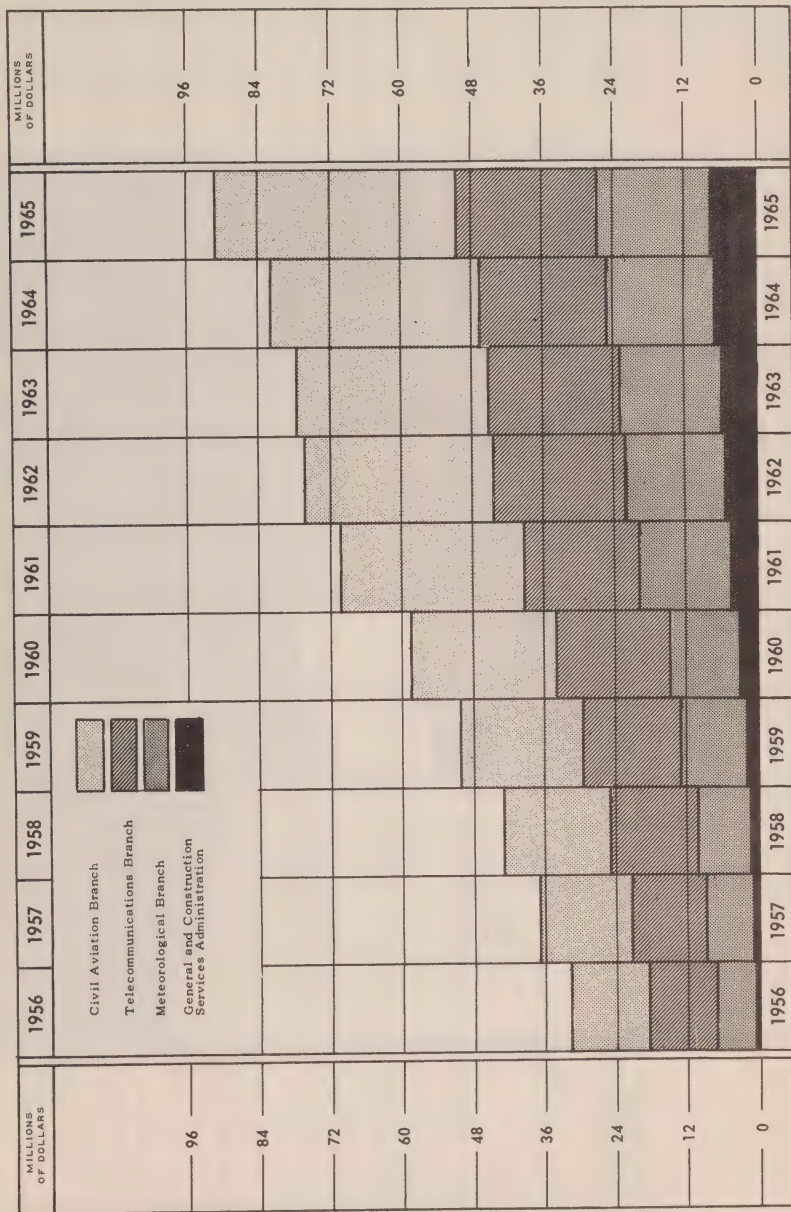
Marine Services—Harbour dues and wharf revenues were up by \$0.6 million. Receipts from earnings of the Canadian Coast Guard, arising from northern supply operations, were \$5.0 million against \$3.5 million the previous year.

Miscellaneous Services—Interest payments of \$43.1 million were received from the St. Lawrence Seaway Authority. Receipts from this source during 1963-64 were \$2.5 million.

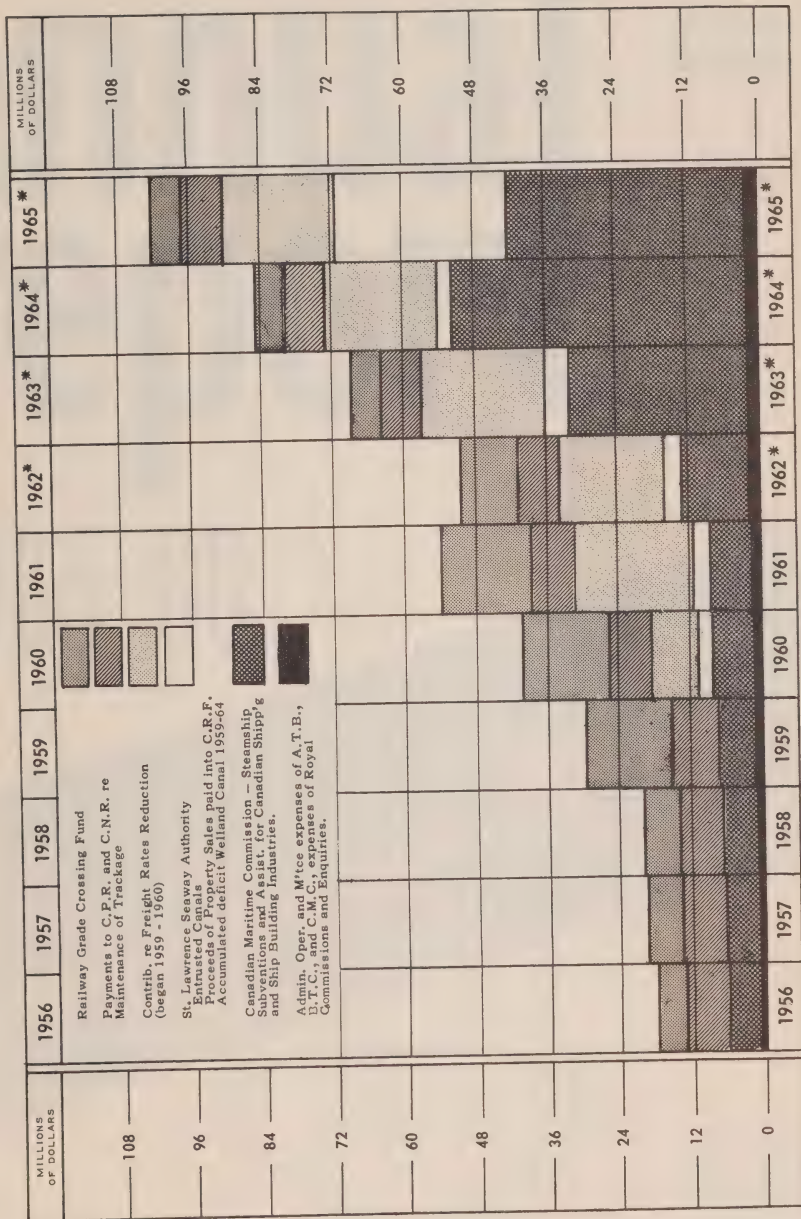
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MARINE SERVICES EXPENDITURES AND REVENUES
FOR THE FISCAL YEARS 1955-56 TO 1964-65 INCLUSIVE



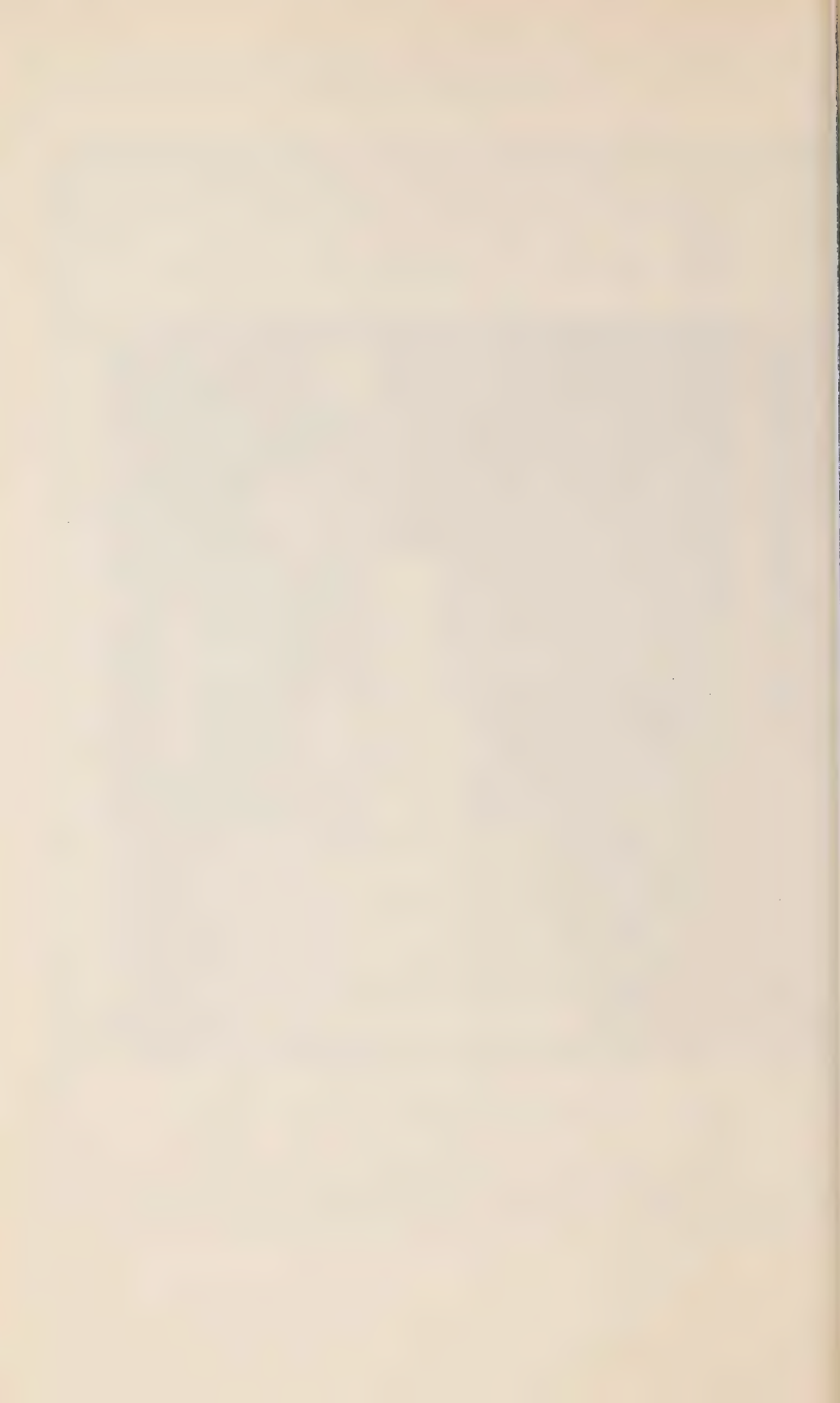
DEPARTMENT OF TRANSPORT
AIR SERVICES-ADMINISTRATION OPERATION AND MAINTENANCE EXPENDITURES
FOR THE FISCAL YEARS 1955-56 TO 1964-65 INCLUSIVE



DEPARTMENT OF TRANSPORT
MISCELLANEOUS SERVICES - EXPENDITURES
FOR THE FISCAL YEARS 1955-56 TO 1964-65 INCLUSIVE



* Does not include payments of \$50 million for freight rate maintenance in each of the years so marked.

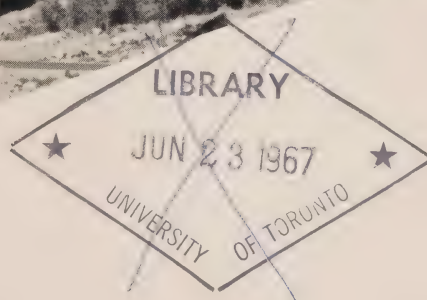


DEPARTMENT OF TRANSPORT

annual report

1965-66

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Publications



FOR THE FISCAL YEAR ENDED 31 MARCH 1966

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ANNUAL REPORT
Department of Transport

COVER—Satellite Tracking Station, Mill Village, N.S.



CANADA

DEPARTMENT OF TRANSPORT

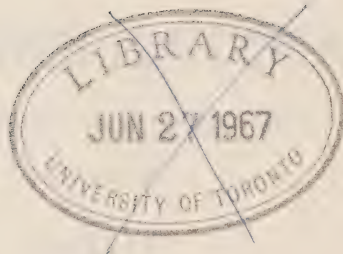
ANNUAL REPORT

FOR THE FISCAL YEAR ENDED

MARCH 31

1966

Submitted Under the Provisions of the
DEPARTMENT OF TRANSPORT ACT



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ERRATA

DEPARTMENT OF TRANSPORT—ANNUAL REPORT 1965-66

Page 43, line 13—For “Lief Ericksson”, substitute *Leif Eiriksson*

*To His Excellency the Honourable Roland Michener, P.C., Q.C., Governor
General and Commander-in-Chief of Canada*

MAY IT PLEASE YOUR EXCELLENCY:

The undersigned has the honour to present to Your Excellency the Annual Report of the Department of Transport, for the fiscal year ended March 31, 1966.

J. W. PICKERSGILL,
Minister of Transport.

**ACTS, AND BOARDS, COMMISSIONS AND CROWN-OWNED COMPANIES
ADMINISTERED BY**

MINISTER OF TRANSPORT

Boards, Commissions and Crown-Owned Companies

Air Canada
Air Transport Board
Atlantic Development Board
Board of Transport Commissioners
Canadian Maritime Commission
Canadian National Railway Company
Canadian Overseas Telecommunication Corporation
National Harbours Board
St. Lawrence Seaway Authority
Steamship Inspection Board

Acts

GENERAL

Bills of Lading Act
Canadian Overseas Telecommunication
Corporation Act
Department of Transport Act
Government Property Traffic Act
Telegraph Act
Transport Act

AIR SERVICES

Aeronautics Act
Carriage of Goods by Air Act
Foreign Aircraft Third Party Damage
Radio Act
Air Canada Act

MARINE

Belleville Harbour Commissioners Act
Canada Shipping Act
Canadian Maritime Commission Act
Canadian National Steamships Act
Canadian Vessel Construction Assistance
Government Vessels Discipline Act
Hamilton Harbour Commissioners Act
Harbour Commissions Act
Live Stock Shipping Act

National Harbours Board Act
Navigable Waters Protection Act
North Fraser Harbour Commissioners Act
Oshawa Harbour Commissioners Act
Port Alberni Harbour Commissioners Act
St. Lawrence Seaway Authority Act
Toronto Harbour Commissioners Act
Trenton Harbour Act
Water Carriage of Goods Act
Windsor Harbour Commissioners Act
Winnipeg and St. Boniface Harbour
Commissioners Act

RAILWAYS

Canadian National Railways Act
Canadian National-Canadian Pacific Act
Canadian National Railways Financing
and Guarantee Act
Canadian National Montreal Terminals Act
Canadian National Railways Pensions Act
Canadian National Toronto Terminals Act
Government Railways Act
Intercolonial Railway and P.E.I. Railway
Employees Provident Fund Act
Maritime Freight Rates Act
Railway Act

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Alouette helicopter, a recent addition to the DOT fleet.

AIR SERVICES

Airports

Development—A number of projects consisting of new construction, the reconstruction, strengthening and extending of runways, taxiways, aprons, car parks, and roads were undertaken during the year.

Major contracts were completed at Gander, Nfld.; Yarmouth, N.S.; Baie Comeau, Val d'Or and Montreal, P.Q.; London, Ont.; Thompson, Man.; Grande Prairie, Alta.; Prince George, B.C.; and Katunayake, Ceylon.

Contracts were awarded at Goose Bay, Lab.; Moncton, N.B.; Gaspé and Montreal, P.Q.; Kapuskasing, St. Catharines and Waterloo-Wellington, Ont.; Yorkton, Sask.; Grande Prairie, Alta.; Castlegar, Dawson Creek and Vancouver, B.C.; and Cambridge Bay and Yellowknife, N.W.T.

Landscaping—Contracts were awarded for landscaping at Fredericton, London, Toronto and the Lakehead airports.

Major Terminals—Contracts were awarded for the Vancouver air terminal building and the addition of a trans-border loading finger to the Montreal International Air Terminal building. The construction of an air terminal building at Katunayake, Ceylon, was undertaken under the Colombo Plan.

Studies for the bridge loading of passengers to aircraft were made for the air terminal buildings at Montreal, Edmonton and Winnipeg, and additional elevators and escalators have been planned for the Winnipeg and Toronto air terminal buildings.

Standard Terminals and General Buildings—Building contracts completed included field electrical centres at Montreal, Sudbury, Winnipeg and Yarmouth; a transmitter building at Ottawa; sandstorage buildings at Halifax, Quebec, North Bay, Sault Ste. Marie, Winnipeg and Edmonton; VOR facilities at Sept Iles, Baie

Comeau, Mont Joli, Kimberley, Sandspit, and Victoria; monitoring stations at St. Lambert de Levis, P.Q., Forth Smith, N.W.T., and St. Anthony, Nfld.; a maintenance garage at Montreal; and a marine radio station at Riviere du Loup.

Contracts were awarded for the construction of VOR facilities for Trinidad; field electrical centres at Sydney, Timmins, Prince George and Whitehorse; sand storage buildings at Montreal, London, Timmins and Lakehead; an aeradio station at Burwash Landing, Y.T.; a rawinsonde station at Moosonee, Ont.; a parts and storage building at Ottawa; an air terminal building at Sydney; and a maintenance garage for Port Hardy.

Working drawings, specifications and cost estimates were in progress on air terminal buildings for Bagotville, Val d'Or, Fort Nelson, Quesnel, Fort Simpson and Fort Smith; maintenance garages at Fort St. John and Watson Lake; a fire hall at Fort St. John; control towers at Calgary and Pitt Meadows; and a marine operations building at Halifax.

Preliminary studies involving architectural design, research and estimating were made or begun for a number of other projects.

Other Projects—A contract was awarded for the installation of moving sidewalks in the passenger tunnels at Montreal International Airport and work was started before the end of the year.

Water supply and sewage disposal facilities were investigated and installations were constructed at a number of sites including Yarmouth and Sydney, N.S.; St. John's, Nfld.; Sept-Iles, Natashquan, Montreal and Fort Chimo, P.Q.; Toronto and Timmins, Ont.; Winnipeg and St. Andrews, Man.; Lethbridge, Alta.; East Kootenay, Prince Rupert, Bull Harbour and Vancouver, B.C.; and Coppermine and Baker Lake, N.W.T.

Projects completed or under way included an underground heating main to the Sydney air terminal building; radar tower for the Coast Guard College; electrical installation in the Coast Guard College machine shop; erection of a Loran "C" 1350-foot tower; replacing antenna towers for the Newfoundland Decca Chain; improvements to apron floodlighting at Ottawa and Montreal International airports; a heating plant for the firehall at the Montreal International airport; modifications to air conditioning and heating at the Ottawa air terminal building and at the Telecommunications systems laboratory.

Power and Lighting—Visual aids to aircraft were provided at 32 sites, and other facilities such as road and carpark lighting were installed at three sites.

Work continued on the design, development and evaluation of flush runway lighting, portable emergency lights and wind socks. The first installation of indoor airport lighting regulators was undergoing testing and evaluation.

Electrical power services to seven terminal buildings was under way and work continued on two major power distribution systems.

Power services to 23 buildings and other facilities were installed and work proceeded on an additional 40. Sixty switchgear replacements and diesel generator unit modifications were undertaken, with 24 projects being completed. Thirty-two diesel-electric emergency power units in capacities ranging from 5 kw. to 500 kw. were installed at various locations.

Airport Operations

The growth of airports and associated facilities is reflected in an increase over the previous fiscal year of \$2,311,000 in expenditures to \$26,425,000 and an increase of \$1,426,000 in revenue to \$24,000,000.

At Frobisher Airport, N.W.T., the Department of Northern Affairs has undertaken the responsibility for operating the single men's messing facility, maintaining all roads in the area, providing fresh water, disposal of sewage and garbage, and for the Department's stores facility.

The former RCAF Station at Knob Lake was taken over and will be managed, operated and maintained by Canadian Marconi under contract.

Approval was given for financial assistance towards the construction of a municipal air terminal and equipment building at Baie Comeau, P.Q.

At Vancouver International Airport, an assignment of \$45,000 was made for modifications and improvements to the old terminal building. The entrance road to the new air terminal is to be named "McConachie Way" in honour of the late Grant McConachie, President of Canadian Pacific Airlines.

Approval of \$2,300,000 for the purchase of the Calgary airport was initiated, and the city of Cranbrook agreed to the department's terms of financial assistance toward construction of buildings and utilities at the new East Kootenay airport.

Financial assistance totalling \$15,000 towards the construction of a new municipal equipment building at Campbell River Airport and \$14,000 for similar work at Castlegar was granted.

A contribution of \$14,492 toward the cost of an equipment building at Flin Flon, Man., and of \$83,791 toward the cost of a terminal building at Thompson, Man., were approved. A payment of \$15,950 to the city of Nelson, the village of Kinnaird, and the village of Castlegar, B.C., toward the cost of erecting an equipment building was also approved.

At Sherbrooke, Que., the city completed constructing a new municipal air terminal building.

Alterations and extensions to the Moncton air terminal building were 88% completed, and a new maintenance garage and firehall at an estimated cost of \$100,000 at Sydney, N.S., was completed.

Effective September 1, 1965, Eastern Provincial Airways contracted to operate and maintain the Deer Lake Airport, Nfld., and the contract for operating and maintaining the airport at Resolute, N.W.T., by Tower Foundation Joint Ventures was renewed for a further five years. The operation and maintenance of the POL tank farm was leased to Imperial Oil Limited.

At Fredericton a new terminal building was officially opened on May 14, and the old building was removed to provide additional aircraft apron area in front of the new construction.

Emergency Services—Extensive aircraft emergency courses were carried out at both Halifax and Edmonton International Airports. These courses were for classified fire officer and fire fighters and volunteer fire fighters.

The fourth annual Air Services Fire Prevention Contest was held concurrently with the Canadian Government and National Fire Protection Association's International Contest, in which 64 Air Services sites were entered.

The Airport Emergency Services attended a total of 1,151 emergencies, 845 of which involved aircraft.

New FWD 2,000-gallon capacity water-nurse trucks were delivered to Halifax, Montreal, Toronto and Edmonton International Airports, and a contract was let for 17 small foam trucks.

Fire losses totalled \$61,085.28.

Maintenance—The trend towards grounds maintenance and snow removal by contract continued during the year, as the advantages, including greater flexibility, fewer personnel and equipment problems and generally lower costs, became more widely recognized.

Evaluation and testing of snow and ice control equipment, chemicals and techniques continued, much of it in co-operation with other agencies including Air Canada, the RCAF and the USAF.

Licences—At the end of the fiscal year, there were 675 airport licences in force.

Bird Studies and Control—Expenditures of \$75,000 were approved for professional services in connection with the reduction of bird hazards at airports and along airways. Considerable field work has been done by the department in reducing areas around airports which would attract birds.

A large radar tracking program, recorded on film, was carried out to determine actual bird migration routes. The information obtained will be used to compute relative hazards and locations of bird concentrations, and will be fed into a computer along with weather data and other factors to see if major migration of various species of birds can be accurately forecast.

Operating Subsidies—Operating subsidies totalling \$176,000 were approved for payment to the following airports: Trenton, N.S.; Saint John, N.B.; Rouyn, Riviere du Loup, Forrestville, and Charlevoix, P.Q.; Lynn Lake, Dauphin, Brandon and Flin Flon, Man.; Prince Albert and Beaverlodge, Sask.; Peace River, Alta.; and Kelowna, Dawson Creek, Campbell River, and Castlegar, B.C.

Air Traffic Control

Aircraft movements controlled by the Department's 33 airport traffic control towers totalled 2,688,239, compared with 2,281,958 in 1964. Of these, 51.1% were local (civil), 24.4% were itinerant (civil), 13.3% were air carrier, 4% were local (military), 3.8% were itinerant (military), and 3.4% were simulated approaches, both civil and military.

The greatest increase was in local and itinerant civil movements, but scheduled airline operations also showed an increase of 8% over last year, marking the first year since 1961 that a gain was recorded.

Itinerant movements by type of aircraft power-plant were as follows: piston engined, 729,647; turbo-propeller, 255,497; turbo-jet, 105,969; and helicopter, 22,394.

The eight area control centres handled 744,915 IFR (Instrument Flight Rules) flight plans and 196,520 VFR (Visual Flight Rules) flight plans.

Gander Area Control Centre oceanic low and high level operations for the year increased by 7,245 or 9.8% from 73,568 in 1964 to 80,813 in 1965.

By type of power plant on a percentage basis, IFR aircraft operations were: jet, 41.5%; turbo-prop, 29.5%, and piston, 29%.

The air traffic control simulation and equipment evaluation facility was moved to the Telecommunications and Electronics Systems laboratory at the Ottawa International Airport. Evaluation projects included Secondary Surveillance Radar (SSR) and radar remoting. Time lapse photography techniques were used to test the radar remoting system while flight check data was being recorded.

Airways and Air Routes

On March 31 there were 16,877 nautical miles of designated low altitude airways, 9,715 nautical miles of low altitude air routes, 15,496 nautical miles of low altitude VOR airways, 14,457 nautical miles of high level LF airways, and 12,026 nautical miles of high level VOR airways.

Airmen Licences

At the end of the fiscal year there were 25,742 airmen licences in force, compared with 24,371 the previous year. These were classified as follows, with 1964-65 figures in brackets: Pilots — glider, 865 (775); private, 16,546 (16,015); commercial, 2,942 (2,571); senior commercial, 373 (341); airline transport, 1,578 (1,418); air navigator, 136 (94); air traffic controllers, 804 (788); flight engineers, 61 (37); and aircraft maintenance engineers, 2,437 (2,332).

A total of 4,503 airmen licences were issued during the same period compared with 3,711 the previous year. By classification, the totals are as follows, with last year's figures in brackets: Pilots — glider, 59 (94); private, 3,183 (2,750); commercial, 736 (553); senior commercial, 101 (61); airline transport, 235 (129); air navigator, 9 (11); air traffic controllers, 4 (10); flight engineers, 19 (5); and aircraft maintenance engineers, 117 (98).

Licences with helicopter endorsements totalled 534 at the end of the year, and instrument ratings Class I totalled 1,569 and 162 Class II.

Aircraft Licensing

Civil aircraft registered at the end of the fiscal year showed an increase of 658 or 9.4%. Of the 7,674 registered, 2,167 were commercial, 5,307 were private, and 200 were State, compared with 2,023, 4,799, and 194 respectively the previous year.

Air Carriers

On March 31 there were 644 commercial air carriers operating the various types of commercial air services in Canada, of which 395 were Canadian and 269 were foreign and Commonwealth.

Aircraft Accidents

During the calendar year 1965 there were 265 accidents, exclusive of minor ones, involving Canadian registered aircraft engaged in civil flying. In addition, there were 23 accidents involving foreign registered aircraft. Fatalities totalled 78.

Flight Services

At the end of the year under review, the departmental fleet consisted of 4 fixed-wing aircraft and 22 helicopters. Of the helicopter fleet, two are operated by the department on behalf of the Department of Mines and Technical Surveys and are based primarily on the Canadian Hydrographic Ship *Baffin* operating along the Maritime coast and in the Eastern Arctic.

The annual summer oil pollution patrol of the St. Lawrence River was carried out from Cornwall to Quebec, with additional regular patrols from Cornwall to Toronto, in the Parry Sound district and the Great Lakes region.

A total of 1195 hours was logged on the flight simulator, providing training on advanced instrument procedures, routine practice training for pilots prior to their semi-annual instrument flight checks and the reconstruction of flights for assistance to the Accident Investigation Division.

During this period the Ottawa Base changed 34 engines and performed 10 major inspections on fixed wing aircraft and 10 overhauls on helicopters.

Aeronautical Engineering and Aircraft Inspection

Four aircraft type approvals, 11 supplemental, and one aircraft engine type approval were issued during the past year. Sixteen type approvals were revised as a result of aircraft configuration and equipment changes. The design and construction of two seaplane floats of Canadian design and manufacture were type approved during the past year and work is continuing with certification of one rotary wing and one special purpose aircraft.

Technical supervision continued over all civil operators, manufacturers, aircraft repair and engine overhaul organizations.

The airworthiness inspection staff has been increased both in the regions and headquarters. This has been made necessary by the increased work-load of manufacturing, repair and overhaul shops, airlines and routine aircraft inspections. The number of ultra-light aircraft being constructed by individuals and clubs has also increased considerably.

Maintenance engineers' examinations assessed increased from 450 in 1965 to 549 in 1966.

Three company approvals were granted during the year, bringing the number of companies now operating under this authority to 59.

Radio Regulations

Licensing—The number of radio station licences in force at the end of the fiscal year was 162,840 compared with 136,912 the previous year. This includes stations operated by departments of federal, provincial and municipal government (excluding the Department of National Defence), stations on ships and aircraft registered in Canada, and mobile stations operating in the public and private land mobile services, but does not include private commercial broadcasting licences.

General radio service licences issued or renewed during the year totalled 19,001 compared with 11,714 in the last fiscal year, with a total of 41,534 in force an increase of 5,422 for the year.

Safety Radio Surveys, Inspections and Suppression of Interference—Radio Regulations inspectors, operating from 33 field offices throughout Canada, conducted

1,030 ship station radio surveys and 15,893 inspections of various classes to ensure compliance with Canadian laws and international conventions and treaties.

There were 18,270 interference complaints and 17,529 were completed, compared with 16,037 and 15,861 respectively the previous year.

Investigation of breaches of the Radio and Canada Shipping Acts totalled 18 and there were 11 court actions.

A total of 9,283 monitoring infractions were issued of which 5,050 were domestic and 4,233 were foreign. Frequency measurements totalled 89,545.

Frequency and Call Sign Assignments—Frequencies assigned, amended or deleted totalled 11,225, and 4,045 were co-ordinated with foreign administrations; call signs amended or deleted totalled 7,821, and there were 188 cases of interstation interference.

Examinations and Certificates of Proficiency in Radio—During the year, 6,411 examinations were conducted compared with 5,491 for the previous year, and 5,787 certificates were issued compared with 5,262 the previous year. As of March 31, the total number of certificates issued was 87,576.

Broadcasting

Applications received for licences to establish amplitude and frequency modulated private commercial broadcasting stations (sound) and for changes of facilities in existing stations totalled 198.

For licences to establish private commercial broadcasting stations (television) and for changes of facilities in existing stations, there were 120 applications, and 281 concerning land stations performing a commercial broadcasting receiving service (CATV).

Applications concerning stations performing an auxiliary service to broadcasting totalled 110, and there were 193 applications for transfers of stock, change in ownership or change in name of licensee.

A total of 62 private commercial broadcasting stations (sound and television)—new or additional facilities—commenced operation. For unattended operation of broadcasting stations using supervisory control systems, 46 applications were received and approved.

The Board of Broadcast Governors was supplied with such data as coverage maps, population statistics and other technical information for new private commercial broadcasting station licences and applications for changes of the facilities of existing stations.

Radio Standards and Frequency Utilization Planning

The development of radio standards specifications and procedures continued in close co-operation with the Canadian Radio Technical Planning Board. Five specifications, including one for colour television, were made fully effective. Ten draft specifications, two draft procedures, and a new series of specifications on technical requirements for microwave systems are under development. Two new single sideband radio standards specifications were completed.

Fees amounting to \$16,650 were collected for the type-approval testing of 34 units for industry in the Radio Regulations laboratory.

A total of 46 proposed hydro line routes were examined for possible interference with existing or proposed radio systems.

Studies began on interference from new electronic ignition systems and the limits of interference desirable to protect the various radio services in Canada, and additional interference tests were made on portable dictating machines used aboard aircraft.

Engineering briefs examined, proposing the establishment of new microwave systems or the expansion of existing systems, totalled 116, an increase of 36% from the previous year. This increase is primarily due to a large number of low-to-medium capacity 2,000 Mc/s systems being installed across Canada and the expansion of existing microwave systems to carry colour television.

Because of the heavy congestion in the 200-415 kc/s band for aeronautical and maritime radio navigation services, greater difficulty is being experienced in finding new assignments and requires more co-ordination. Four major United States communication satellite stations were co-ordinated with the Canadian environment, and two similar Canadian earth satellites are under study.

Monitoring stations increased from seven to nine, with plans for two more within the next four years.

National Telecommunications Planning

Communications expansion and improvement in northern Canada for public and government service continued under the guidance of the Department. A public telephone service was established in the Keewatin District, and the Mackenzie Valley system constructed by Canadian National Telecommunications was completed to its northern terminal at Inuvik by August.

Studies were made of the possible expansion of mobile radio service along the Alaska highway and the Whitehorse-Dawson City highway, and policy outlining the relationship of private radio and public carrier services was developed with regard to mining and exploration groups in the Yukon.

Administrative Telecommunications Agency

Extensive savings in monthly long-distance calls were effected by arranging with the Trans Canada Telephone System for a private network service whereby Government telephones at Ottawa can reach most parts of Canada for official business.

Administration of the Keewatin telephone service was assumed by the Agency in June and undertaken by the Regional Director, Air Services, Winnipeg.

The consolidated switchboard at Edmonton, transferred from the Finance Department, was placed under the management of the Regional Director, Air Services in October.

In January consolidated service for Government telephones at Montreal commenced, marked by the introduction of modern cross-bar common control telephone switching equipment. Direct-dialed wide area telephone service covering the province of Quebec was made available to these telephones to test the feasibility and acceptance, the results of which were satisfactory.

Several new services were added to the consolidated system in Toronto, which was expanded from a single switchboard in the federal building to a much larger

area using facilities of the Central Office Centrex type and providing direct access to Federal Government telephones at Ottawa.

In March, new procedures were introduced to facilitate rapid service expansion as additional lines are needed for the 26,000 consolidated government telephones at Ottawa. The Agency was also designated as general adviser on all aspects of procurement and use of administrative telecommunication equipment and services.

Radio Communications and Aids to Navigation

Marine-Shore Stations—Installations completed during the year included a radio station at St. Lawrence, Nfld., replacing Cape Race and Burin; a new VHF control station for pilotage at Cornwall, Ont.; an interim VHF system for St. Lawrence River traffic control; and a new transmitter building at Alert Bay.

New facilities under construction include a marine radio station at Comfort Cove, Nfld.; an operations building at Kingston, Ont.; a marine traffic control station at Quebec for the St. Lawrence River traffic control system; and a transmitter site at Bull Harbour, B.C.

Ship Stations—The revision of communications equipment on 20 Coast Guard ships was either completed during the year or under way.

Fixed/Aeronautical Communications—Communications equipment for control on operational areas was installed at the Edmonton Industrial airport; Kamloops and Pitt Meadows, B.C., and Coral Harbour, N.W.T., with one for training at the Air Services Training School at Ottawa. Installations are under way at Comfort Cove, Rivière du Loup, and Montreal.

Equipment for precision approach radar training was installed at the Air Services Training School Unit at Carp.

Peripheral circuits were completed from five Area Control Centres; Moncton to Yarmouth; Toronto to Stirling, Sarnia, Wiarton and London; Winnipeg to the Lakehead; Edmonton to Calgary; and Vancouver to Enderby.

System design, equipment fabrication and procurement and antenna installation for the ground station at Mill Village, N.S., which will provide single sideband quarters, have been completed.

Low-Frequency Aids—Marine radio beacons of various types were established at Cape Makkovick, Lab., Miscou Island, N.B., Great Duck Island, Ont., and Button Island and Ash Inlet, N.W.T.

At Rivière du Loup, P.Q., and Burlington, Parry Sound, Collingwood, Port Colborne, and Port Weller, Ont., DF calibration beacons were established.

Aeronautical radiobeacons were completed at Natashquan, P.Q.; Dafoe, Sask.; Payne Bay, Arctic Bay, Grise Fiord, Pangnirtung, Pond Inlet, Cape Dorset, and Fort Good Hope, N.W.T.; and Watson Lake and Whitehorse, Y.T.

A combined aeronautical/marine radiobeacon was established at Sable Island, N.S., and a Loran "C" station at Cape Race, Nfld.

Very High Frequency Omni-Range (VOR) and TACAN—Six VOR facilities were commissioned during the year—doppler installations at Port Hardy and Sandspit, mountain-top installations at Princeton, Kimberly and Enderby, and a standard installation at Rocky Mountain House—and were under construction at Sept Iles, Baie Comeau, Mont Joli, North Bay and Victoria.

Seven omni-test equipments were installed and commissioned at various locations, bringing the total to sixteen.

Plans and specifications for a VOR building and a complete set of equipment were shipped to Trinidad under the External Aid program.

TACAN (Tactical Air Navigation) systems co-located with departmental VOR sites were commissioned at Stirling, Wiarton, Kleinburg, Lakehead, Kenora, Winnipeg, Saskatoon, Calgary and Edmonton, and five more were placed under test.

Instrument Landing Systems—Instrument Landing Systems (ILS) at Abbotsford-B.C., and Whitehorse, Y.T., glide paths serving runway 08 at Vancouver and runway 12 at Prince Rupert, and the reconstructed localizer serving runway 28 at Calgary were commissioned.

Evaluation flight checks for categorization to ICAO standards were carried out at Gander, Halifax, Montreal, Ottawa, Toronto, Winnipeg, Calgary and Edmonton.

Radar—Precision Approach Radar (PAR) simulator and radar displays were installed in the Air Services Training School at Carp, Ont. Secondary surveillance radar equipment was installed at 15 sites across Canada and the remaining four systems will be completed in 1966.

Video integrators were installed in all AASR-1 radars to intensify the display of weak signal returns.

Tunnel Diode amplifiers installed in the PAR at Toronto for evaluation improved the performance sufficiently to have this modification added to all PARs next year.

"C" band weather radars went into operation at Halifax, Toronto, Winnipeg and Edmonton, the operation of which is being improved by a number of modifications.

Marine equipment installed on Canadian Coast Guard ships included 15 radar sets, seven gyro compasses and 18 echo sounders, and similar equipment was procured for vessels under construction.

Automatic Picture Transmission (APT) equipment was procured and installed at Toronto and Halifax. This equipment receives and records pictures of the earth cloud cover which are transmitted from weather satellites such as Essa and Nimbus.

Maintenance and Operations

Modern techniques have been gradually introduced into the ionospheric service to improve the output and reduce the cost of operation. Data calculations and print out have been completely automated through a computer program developed within the department. Studies have been conducted into obtaining remotely monitored ionospheric sounding equipment and into semi-automatic scaling methods.

The Churchill ionospheric station gave considerable support to the various rocket programs, and the station at Resolute continues to do telemetry recording and command for Alouette I and II, and some United States satellites. All stations continued twice daily special soundings at the time of Alouette's nearest passes.

As part of the plans for automation of teletype communications at major centres, semi-automatic systems were installed at Gander, Montreal, and Toronto, bringing to six the number of communications centres so equipped. Additional

duplex circuitry was provided between Edmonton, Winnipeg and Toronto, and a direct circuit was commissioned between Vancouver and Edmonton.

On February 15, the West Coast marine radio stations began participating in the Automated Merchant Vessel Report System (AMVER) which has been expanded to include the Pacific as well as the Atlantic Ocean areas.

The North Sydney marine radio station was decommissioned and the ship-to-shore communications service was transferred to a combined marine/aeradio station at Sydney.

At the Halifax marine radio station, the 8 Mc/s "high seas" marine telephone service frequency was commissioned as part of the program for providing single sideband radiotelephone service at all Canadian marine radio stations.

Two additional VHF frequencies were fitted on Canadian Coast Guard ships and at appropriate marine radio stations. One frequency will provide Coast Guard ships with an exclusive channel for intership operational communications, and the other is for joint Canadian Coast Guard-U.S. Coast Guard use in co-ordinating search and rescue operations.

Training—A variety of technical training on new and specialized types of electronics equipment was arranged for departmental staff and co-operative inter-departmental technical training was provided for the Department of Northern Affairs and National Resources.

Arrangements were completed to train additional technicians on VOR equipment for the government of Trinidad and Tobago.

Eighty-two radio operators were trained in the basic radio operating course, 334 technicians electronics in a variety of technical courses, and 28 lightkeepers in the maintenance of marine radio beacons.

Arrangements were also made with training organizations outside the Air Services School for 92 students.

Research

Space systems—The installation of the electrical systems at the experimental satellite communication earth station in Nova Scotia was completed in February and since then the station has engaged in an extensive pre-operational test program which is required before it can be committed to regular operations later in 1966.

Navigation Aids, Radar and Video Systems—The study and evaluation of the shelters, power supplies and telemetering systems for unattended facilities in isolated areas continued. The thermoelectric generator was successfully tested in conjunction with a radio beacon, and the work is continuing on a marine beacon configuration.

Preliminary trials of the forward-looking echo sounder installed on the CCGS *John A. Macdonald* produced several problems and modifications will be installed and tested prior to the ship's voyage to the Arctic.

Studies continued in accurate determination of the position of helicopters used by the icebreakers for locating open channels.

Studies of doppler radar for cloud physics investigation resulted in the production of technical specifications acceptable to the Meteorological Branch.

The operation of a test instrument for flight checking radio aids to navigation, designed and produced during the year, was completely satisfactory and should materially decrease the cost of flight checking and improve the reliability of results.

A study project was begun on high speed data transmission on telephone lines, and also an Omega system theoretical study and evaluation.

Computing Systems—The Gander Automatic Air Traffic System (GAATS) is scheduled for operation in July 1967. Developed in co-operation with the Civil Aviation Branch, the system will aid air traffic controllers by performing certain routine tasks automatically, and will provide improved use of oceanic air space through the ability of the computer to perform extensive calculations on the flight paths of aircraft with considerably greater precision than can be done manually in the time available in the present system.

The program tracking and timing sub-system consisting of a digital computer and auxiliary equipment was tested and accepted for the communication satellite ground station.

A computer program to prepare steering tapes for tracking communication satellites was written and the tapes produced were used successfully for tracking Relay II.

A computer program to calculate positions of radio stars with respect to any point on earth was written and enables calculations of star positions with a greater accuracy than from usual sources. The results of the program were used to calibrate the satellite station antenna at Mill Village, N.S.

Engineering and Scientific Computing Services have been provided to various units of the Branch and a number of programs have been written to provide solutions to complex scientific and engineering problems.

Landline Services

Air Traffic Control—The Air Traffic Control Interphone (national network) service was expanded with the provision of "hot line" circuits between Regina-Moose Jaw, Ottawa-Montreal, Montreal-Boston, Moncton-Boston; and express circuits Winnipeg-St. Andrew, Moncton-Sept Iles.

Push button control panels and associated equipment for the termination on interphone circuits at area control centres, terminal control units, and control towers, have been installed at Vancouver, Abbotsford, Edmonton, London, Ottawa and Moncton, and installations are proceeding at ten other locations.

Other leased national network services were relocated from Crescent Valley to Castlegar, Ashcroft to Kamloops, Buchans to Deer Lake, and provision has been made to lease national network services at Burwash, Y.T. to replace existing service connections at Snag and Aishihik.

A direct controller-to-pilot circuit was established between Moncton-Fredericton, the interphone circuit Winnipeg-Churchill was modified for alternate DCPC use, and the DCPC Toronto-St. Thomas was re-arranged Toronto-London.

Air and Marine Operations—The airops national teleprinter network was extended to Norman Wells and Wrigley, N.W.T.; new circuits were installed Vancouver-Edmonton, Edmonton-Winnipeg, Moncton-Millinocket, Maine; and existing circuits were modified and re-arranged Vancouver-Edmonton-Winnipeg.

The search and rescue interphone service on the Pacific coast was extended to Ladner and Tofino lifeboat stations, and marine teleprinter service was extended to Riviere du Loup, P.Q.

Meteorological Services—Weatherfax (facsimile) network service was extended to Penticton, London, additional locations in the Ottawa area, and Fredericton, and to various Department of National Defence establishments on an emergency call-up basis.

Supplementary weatherfax network service was extended to Halifax, Winnipeg, Edmonton, and Vancouver, and the Montreal Central Analysis Office was provided with a connection to a second United States Weather Bureau weatherfax circuit.

Weather teleprinter national network service was extended to Penticton, Pitt Meadows, Chapleau, Ottawa Flight Dispatch, Gagnon, Forrestville, Fredericton, Trepassy, and St. Anthony, and to various Department of National Defence establishments on an emergency call-up basis.

Three new multi-point weather teleprinter circuits were added to the national network service: Edmonton-Winnipeg; Winnipeg-Toronto, and Toronto-Montreal. Three special weather teleprinter circuits, one in the Toronto area and two in the Montreal area, were installed between meteorological offices and press, radio and television establishments.

Telewriter service was extended to London and telex installations were completed at Red Lake, Meadow Lake and the weather office at Winnipeg.

The departmentally-owned cable plant at nine sites were disposed of and negotiations are under way for similar action at eight other sites.

Negotiations were completed and orders issued for the lease of a circuit to remote control VHF radio installations at Sept Iles, Sydney, St. John's, and St. Anthony on behalf of Aeronautical Radio Incorporated to permit communications between their New York control office and certain international trans-Atlantic air flights.

Communication requirements were co-ordinated on behalf of the Canadian press, radio television agencies and Secretaria De Comunicaciones Y Transportes of Mexico for the Olympic Games to be held in Mexico City in 1968.

International Conferences

The department was represented at a number of international conferences including the Plenipotentiary Conference of the International Telecommunications Union (ITU) at Montreux, Switzerland, at which Canada was re-elected a member of the Administrative Council; the twentieth session of the Administrative Council held in Geneva, and a ceremony held in Paris to commemorate the century of the founding of ITU; Commonwealth Telecommunications Conference in London and its related meetings in Sydney, Australia, and Nairobi, Kenya; the Ground Station Committee meeting of the National Aeronautics and Space Administration in Tokyo, and a number of meetings of the Advisory sub-Committee on Technical Matters for the Interim Communication Satellite Committee in Washington; Maritime Safety Committee in London; and the Radio Technical Commission for Marine Services in Williamsburg, Va.

Meteorological Observing Program

Surface Network—During the year under review, 288 land stations reported basic weather information in synoptic and/or aviation format, an increase of three. Of the 234 stations providing aviation observations, 158 reported on a 24-hourly

basis. At 43 locations the observing program is carried out under contract. Stations reporting winds aloft by visual pilot balloon methods decreased from 40 to 34.

The noctilucent cloud observing program for the International Quiet Sun Years (IQSY) terminated on December 31, 1965. As a result of continued national and international interest, however, and subsequent to recommendations from the World Meteorological Organization (WMO), the program was continued and expanded from 44 to 70 surface stations.

Until February 28, 1966, 64 stations participated in the visual auroral program for IQSY. Over a reduced network of 40 stations, the program continued in support of the National Research Council's need for further and continued information.

The snow survey program was expanded from 43 to 76 stations. For the benefit of the department's Construction Branch, 29 stations continued the frost depth program using the Gandahl Indicator.

On behalf of the Department of National Health and Welfare radioactivity studies, 24 stations continued the air, precipitation, and soil sampling program commenced in the spring of 1959. At a few selected stations sampling is conducted on behalf of United States and international agencies.

To maintain approved standards of observations, inspections of synoptic, aviation and climatological stations continued. A total of 24 inspectors carried out 2,122 inspections, completing 55 barometer comparisons, 310 inspection reports and photographs of 151 stations. Twenty-one of the inspectors were directed by the Regions; the remainder were headquarters personnel. Two of these worked on the DEW line and the other worked on International Hydrologic Decade (IHD) projects.

Installing and servicing equipment for special and capital projects required a greater percentage of inspection time than usual. An example is the rapid expansion and establishment of IHD stations.

Inspectors from the six Air Services regions and the two from the Department of National Defence attended the tenth Inspectors' Conference held in Toronto, April 5-9, 1965.

Marine Network—Merchant and other vessels reporting marine weather under the supervision of the Branch totalled 120, an increase of three from last year. Of these, 55 ships reported from the Atlantic Ocean, the Eastern Coastal waters and the Eastern Arctic, 28 from the Pacific Ocean and Western Arctic, and 37 from the Great Lakes. During 1965 these ships made approximately 37,700 observations, an increase of about 4,300 over the previous year.

In addition, 150 ships were recruited on a trip-to-trip basis as auxiliary reporters to provide a greater coverage of the Pacific Ocean. Weather records totalling 9,403 observations were returned by 76 of these ships.

Port Meteorological Officers (PMO's) supervised the weather observing programs of these ships, and provided advice and assistance in meteorological matters to domestic and foreign shipping. During the year these officers, located at Halifax, Saint John, Montreal and Vancouver, made 1,506 visits to ships of more than 20 nationalities. Headquarters staff and meteorological inspectors from the Toronto region carried out PMO duties at a number of ports in Southern Ontario, making 76 visits.

In recognition of excellent work carried out by officers on voluntary observing

ships in 1964, 55 awards, in the form of books, were presented to various ships and individual officers of the Canadian weather observing fleet.

Break-up and freeze-up reporting at 190 meteorological stations and daily water-temperature reporting at 15 locations on the St. Lawrence Seaway continued.

Joint Arctic Weather Stations—The basic meteorological program at each of the Joint Arctic Weather Stations—Resolute, Mould Bay, Isachsen, Eureka, and Alert—consisted of eight synoptic weather observations, and two complete upper air observations a day. The pilot balloon upper wind program was discontinued at the end of May.

At Alert, Eureka, Isachsen, and Mould Bay the program was increased by hourly and special surface observations during periods of unusually heavy flying activity, such as during the resupply airlift or when aircraft were operating in the vicinity in support of other scientific expeditions during the summer months. At Resolute, hourly and special surface weather observations were carried out on a year-round basis.

At Resolute, Alert, and Eureka, additional scientific programs included measurements of radiation, sea ice thickness, snow depth, observations of aurora, and measurements of soil temperatures. The ozone program at Resolute was expanded late in the year to include ozone soundings. At Alert and Mould Bay, seismic and magnetic observations were made throughout the year for the Department of Mines and Technical Surveys. The five weather stations also provided an advanced base for the operations of other scientific activities in the Arctic Archipelago.

Forecast and weather briefing services for flights operating out of Resolute were provided on a year-round basis.

At Mould Bay the upper air installation was moved to a nearby hill to avoid local obstructions so that winds of very high levels may be measured. Communications were improved by the installation of low frequency radio equipment, and an additional air-to-ground radio communications frequency.

Single side-band radio communication equipment was installed at all satellites.

Runways at Alert, Eureka, and Mould Bay were developed to dimensions of 200 feet in width and more than 5,000 feet in length; at Isachsen the runway was widened to 175 feet and will also be more than 5,000 feet long when development is completed.

Isotope-Powered Automatic Weather Station—Installed at Sherwood Head, Axel Heiberg Island, N.W.T., in 1961, this station was serviced and reactivated in August 1964. Subsequently the transmissions deteriorated progressively until by December barometric pressure only was being received at Resolute. In March 1965 improvement was noted and by the end of the month all data transmitted were again being received at Resolute on both frequencies. The station was deactivated in April and removed in August for use elsewhere.

Upper Air Observations—Upper air observations were taken at 12-hour intervals by a network of 32 stations. Essential in preparing weather forecasts, the information is coded and transmitted to the various forecast centres. Upper air data are also exchanged, wherever possible, with other countries which may have a similar requirement for such information.

At Coppermine, Frobisher and Port Hardy, seismic observations continued on a co-operative basis for the Department of Mines and Technical Surveys. At Goose,

Labrador, and Churchill, Man., ozonesonde ascents continued for the U.S. Airforce Cambridge Research Laboratories (AFCRL) at Bedford, Mass. From the beginning of January, Churchill discontinued the program at the request of AFCRL, but plans are under way to initiate a totally Canadian program at several upper air stations.

In support of the Alberta Hail Project, two upper air ascents were made daily from June 1 to September 15, with additional ascents when required. At Whiteshell, Man., tethersonde observations were undertaken for the diffusion trials in July and August. The ascents reached 1,000 feet as a maximum altitude to determine an accurate temperature profile of the layer of air subjected to the trials.

Upper Air Inspection—All upper air stations were inspected by the three inspectors located in Montreal, Winnipeg and Edmonton. The new automatic tracking (GMD-2) radiosonde ground equipment installed at several stations required the inspectors to spend more time in instructing personnel in the new techniques and procedures. The inspectors also investigated possible sites for relocating stations where the terrain is not suitable for optimum GMD-2 operations.

Upper Air Instalations—GMD-2 installations were completed at 12 locations—Maniwaki, Sable Island, Norman Wells, Fort Nelson, Baker Lake, The Pas, Hall Beach, Whitehorse, Coral Harbour, Stony Plain (Edmonton relocated), Port Harrison and Frobisher. Installations are expected to be completed in the next fiscal year at Sachs Harbour, Moosonee, Trout Lake, Fort Chimo and Sept Iles. The Decca radar at Port Hardy will be replaced by GMD-2, in keeping with standardizing the radiosonde ground equipment at all stations.

The program to equip the upper air stations with electrolytic hydrogen generators has been under way for the past year. Twenty-four generators, including one for the Department of National Defence, were manufactured. Several are awaiting transportation by supply ships and four are being held until construction projects are completed. The generators have been in use at Resolute, Mould Bay, Isachsen and Eureka since the fall of 1965, and in Edmonton and The Pas since February 1966.

Pacific Weather Ships—Throughout the year CCGS *Stonetown* and CCGS *St. Catharines* manned weather station "P", located in the Pacific Ocean some 1,000 miles from Vancouver. A vital upper air and surface observing station, it is also a scientific base for oceanographic research and studies.

Forecast Services

Forecasting System—The forecasting system has three distinct operating levels—the Central Analysis Office (CAO) at Montreal, Weather Centrals, and Weather Offices. A Weather Central was established in the Maritimes in 1962-63, in British Columbia in 1963-64, and early in 1966 the Prairie Weather Central was established in Winnipeg. Additional Weather Centrals are planned.

A large number of Weather Offices use the guidance of the CAO and the Weather Centrals to provide services direct to the public, agriculture, forestry, aviation and other sections of the economy.

Aviation Forecasts—Weather forecasts for aviation were prepared several times a day for airports and aviation regions covering most of Canada. Designed for short- and medium-range civil and military aircraft, these forecasts were distributed to national and international aviation interests. For long-range and

high-altitude flights over Canada, including the Arctic, area forecasts prepared at the high level forecast centre in Montreal were issued in chart form and distributed by facsimile. Additional coverage over international routes to Europe, Asia, Honolulu, the Caribbean, and Central America was provided by the exchange of forecasts in chart form with the United States.

Special forecasts were prepared for military exercises, ice surveys, Arctic flights, glider meets and other aviation activities not covered by routine forecasts.

Public Forecasts—Weather forecasts were issued for all populated areas of Canada and were provided to the press services for distribution to the general public by radio, television and newspapers. The forecasts covered expected conditions for the current and following day; the afternoon and evening forecasts included an outlook for "the day after tomorrow".

The automatic telephone weather service operated by a commercial agency in Montreal and Toronto was discontinued on October 1, 1965. As a partial substitute for this service, city weather teletype circuits connecting the weather offices in Montreal and Toronto with local newspaper, radio and television newsrooms were installed on an experimental basis.

Special Forecasts—The general public weather services were supplemented by forecasts for specific requirements. These included frost and wind forecasts for fruit growers in the Okanagan, Niagara and Annapolis areas, for tobacco growers in southern Ontario, and special advice for agriculturists in southern Ontario and the Maritimes during harvesting.

In Alberta, the provincial Department of Agriculture and the weather office in Edmonton co-operated in providing farmers with agricultural weather forecasts throughout the growing season. A somewhat similar co-operative program for a more restricted area in Saskatchewan was provided jointly by the Saskatchewan Research Council and the Saskatoon weather office. The forestry weather advisory unit at the Vancouver weather office provided an expanding range of forecasts and advisory services to the British Columbia forest products industry and the forest protective service.

During the winter months, special snow forecasts for mountainous regions of British Columbia were issued for the benefit of travellers, resort operators and skiers, and advice was provided for avalanch control. Special snowfall forecast programs were continued in Ontario and Quebec for the benefit of utilities and transportation agencies.

Special Advisory Services—Warnings were issued whenever hazardous conditions, such as freezing rain, heavy snow or rain, blizzards, gales or severe cold were expected to endanger life and property. Advisories were issued when conditions were expected which might subsequently develop into more serious proportions or would cause inconvenience or discomfort. Marine warnings were issued for coastal waters when dangerously high winds were expected. Warnings covering weather of special concern were relayed direct to conservation and civil authorities, public utilities and transportation interests, and were also widely distributed through radio, television and the press.

Communications—The meteorological teletype system with 59,700 miles of circuit, served 392 stations with 664 connections. Three supplementary circuits were commissioned.

The weatherfax system served 86 stations equipped with 102 connections over 13,700 miles of facsimile network.

Ice Observing and Forecasting

The ice observing program continued to expand to meet marine operations requirements. There were two major developments during the year: specifications were prepared for multi-engine aircraft especially modified and equipped for aerial ice reconnaissance; and approval was granted for entering into a five-year contract with a company for the provision of two aircraft to meet these specifications. Scheduled for delivery in autumn 1966, these aircraft will provide for the first time an observing position especially designed for ice reconnaissance and will also provide the best avionic equipment available for navigation especially in areas where there are few radio aids. Radar will also be provided to supplement the visual observing program.

In co-operation with the Telecommunications and Electronics Branch, studies commenced on the suitability of various types of radar for ice observing. A feasibility study was made on a type of radar equipment which could be used to measure ice thickness from aircraft.

Chartered aircraft flew 2,967 hours of aerial ice reconnaissance over the Eastern Canadian seaboard, Arctic and sub-Arctic areas including the Hudson Bay route to Churchill, and certain inland waterways including the St. Lawrence Seaway, the Great Lakes, Lake Athabasca, and Great Slave Lake.

Frequency of coverage increased over the St. Lawrence River between Montreal and Quebec and in the Lake Melville area during the winter months.

Ice observing was also carried out on Canadian Coast Guard icebreakers on the Eastern seaboard and in both the Eastern and Western Arctic.

Ice forecasts were provided for marine operations in the Gulf of St. Lawrence, Newfoundland and Labrador coastal waters, Hudson Strait and Bay for general marine navigation, and in Arctic waters when shipping was engaged in the annual resupply of weather stations and other northern sites.

Climatology

Operations in this field include the management of the climatological networks, collection, analysis, quality control, summarization and publication of meteorological data from climatological observing stations, and providing comprehensive climatological information and advice to other government departments, industry and the general public.

More than 5,000 requests were received for information, and projects were completed for the Water Resources Branch, Canadian Press, the National Research Council, the Alberta Farm Economics Branch, the Ontario Department of Agriculture, and other government agencies.

Networks—The preparation of an historical catalogue listing all climatological stations, their complete observing programs and establishment dates was begun in 1965. By the end of the fiscal year, catalogues were completed for Newfoundland, Prince Edward Island, New Brunswick, Manitoba, Saskatchewan, Alberta, British Columbia, Yukon Territory and the Northwest Territories.

Upper Air data Control—Upper air observations of pressure, temperature,

humidity and wind velocity from 32 full-time, and one seasonal radiosonde station, and upper wind observations from 12 other stations were edited, reviewed and processed. Upper wind reports from an additional 25 pilot balloon stations were placed in the archives. The first volume of the *Upper Air Climate of Canada*, consisting of ten-year monthly average, extreme and standard deviation values, was published and work continued on a set of maps to be published as a companion volume.

Research

Arctic—A manuscript on the climate of the Hudson Bay area was prepared for publication and climatological records for stations along the DEW Line were summarized and published. Various northern activities of government and industry were supplied with climatological advice including a feasibility study of the Milne Inlet route, planning for aerial photography over Ungava, off-shore drilling along the mainland Arctic coast and Hudson Bay, and an inventory of economic and political aspects of the Northwest Territories. Two unusual weather features of the 1965-66 winter season are being investigated: strong winds at Resolute in November and severe and persistent cold in northwestern Canada in January.

Bioclimatology—Micro- and mesoclimatological conditions affecting fruit growing areas north of Lake Erie and southeast of Lake Huron continued under study, aided by using sensors mounted on a motor vehicle. The mobile equipment was also used in surveys of the Georgian Bay area to find key areas for fixed microclimatological stations. This investigation is being carried out in collaboration with the Ontario Research Foundation.

In the Forest Meteorological Project, undertaken in collaboration with the Canadian Department of Forestry to study the microclimate of mature forests and clear cut areas for forest regeneration, intensive investigations were carried out on finding the capability of equipment, and on testing models suitable for determining the various energy components. At the microclimatological station established in August 1964 at the Petawawa Forest Experimental Station, observations of temperature, humidity and wind at several levels at a height of 200 feet were undertaken along with careful observations of the most important components of energy exchange between air, soil and biomass. Moving sensors to record temperature, humidity and radiation under the forest canopy were designed to give space-average values of these parameters. Short period studies of the microclimate of another forest species and clear space were initiated.

Hydrometeorology

A substantial increase in hydrometeorological research was undertaken in 1965-66 as part of the Canadian program for the International Hydrologic Decade (IHD). The Branch is participating in 34 projects, with work beginning shortly on 15 more.

Historical storm rainfall studies for Ontario are being undertaken for the preparation of generalized maps of probable maximum precipitation for Canada. Co-operative projects on flood flows in Nova Scotia and critical meteorological conditions for maximum floods in the Quebec South Shore area are nearing completion.

As a contribution to the International Joint Commission's investigations of Great Lakes levels, studies of basin precipitation, water temperatures and winds over the lakes were intensified. Studies are under way to establish the optimum density

of a land area precipitation network required for Great Lakes investigations. When completed, precipitation data back to 1900 will be adjusted to the new criteria.

With an extensive evaluation of the airborne infra-red radiation thermometer successfully completed, regular survey flights of each Great Lake were undertaken. The additional water temperature data will make it possible to evaluate and publish monthly evaporation estimates on each of the Great Lakes. Research activities continued in co-operation with University of Toronto's Great Lakes Institute field station at Baie du Dore on Lake Huron with the instrumentation of a lake tower and the acquisition of a research pontoon craft.

Physical Research

Cloud Physics and Atmospheric Electricity—In August the University of Western Ontario contracted to undertake a survey and critical assessment of radio, optical and combined radio-optical techniques in the detection and tracking of lightning discharges, with particular but not exclusive reference to the value of such methods for locating lightning-caused forest fires. The final report is expected in July 1966 and should form the basis for further research in this field.

In the Sudbury area there were again few cases of supercooled fog and therefore no cloud seeding tests could be carried out. The project will be continued.

Precipitation Physics Project—Analysis of cloud seeding with silver iodide, carried out in the Rouyn-Noranda area of Quebec between 1959 and 1963, was completed and the results were published during the year. No significant effect due to cloud seeding was detected.

Alberta Hail Project—A joint project of the Meteorological Branch, the National Research and the Alberta Research Council, and operated by the Stormy Weather Research Group of McGill University, the objective is to discover the basic causes of hail and how to prevent it. Data collected in the field during the hail season were analysed at McGill and a number of reports were published on ice nucleation studies, the temperature of hailstones, the size distribution of Alberta hail samples and the relation between large-scale vertical motion and the occurrence of severe storms.

Radiation—The National Atmospheric Radiation Centre facilities were improved with the completion of long-wave laboratory calibration facilities and improvement of other calibration equipment.

A number of experimental and instrument development projects were undertaken including designing and testing a radiometersonde for radiation measurements in the atmosphere, and the design and construction of the platforms, mounting and recording apparatus for radiation measurements on the new weather ships.

Ozone—Ozone soundings of the stratosphere, using the Mast version of Brewer bubbler ozonesonde, were started at Resolute Bay, N.W.T. in December as a pilot project to examine the problems and workload of using the ozonesonde on an operational basis.

A new synchronous rectifier system was developed for the Dobson ozone spectrophotometers, which reduced noise and increased its reliability. The instruments at Edmonton, Resolute Bay and Toronto (Scarborough) were modified and the others will be modified in 1966.



Coast Guard Day at Quebec Marine Agency, June 20, 1965.



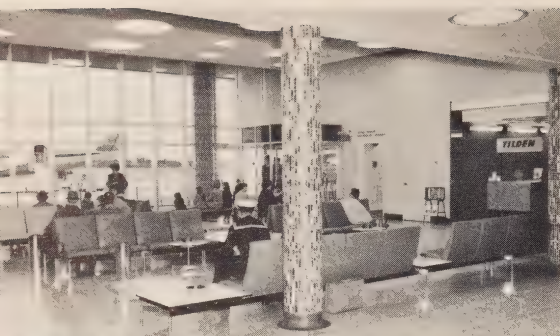
CCGS *John Cabot*, showing helicopter hangar.



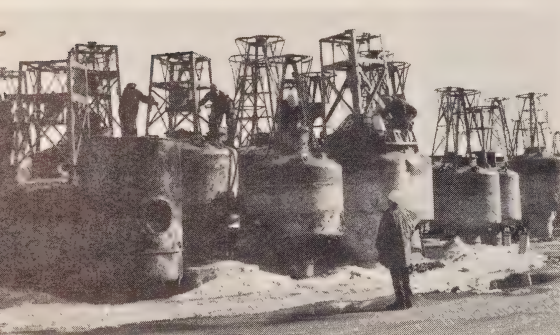
St. Lawrence Ship Channel hydraulic model showing the area downstream from Boucherville Islands.



Coast Guard Day at Prescott, Ont., Marine Agency, July 1, 1965.



Main waiting room — Fredericton air terminal



Repairing and painting buoys.



General waiting room — London air terminal



London, Ont., air terminal, officially opened
April 10, 1965.

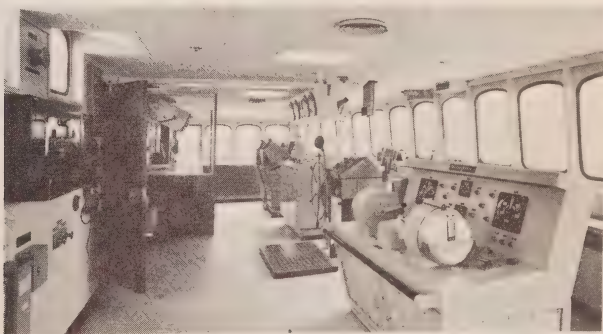
DOT hangar at Ottawa International Airport showing some of the departmental fleet.



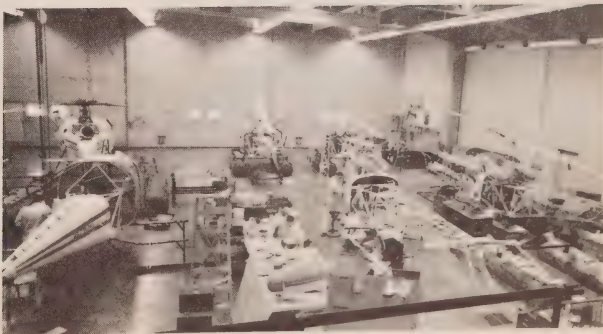
Display of aids to navigation — Coast Guard Day at Quebec.



CCGS *John Cabot* navigation bridge



Helicopter overhaul shop in DOT hangar, Ottawa International Airport.





The operating efficiency of radio aids to air navigation being checked aboard a specially equipped departmental aircraft.

Fredericton, N.B., air terminal, officially opened May 14, 1965.



New Swift Rapids Lock officially opened August 21, 1965.

Synoptic Research—The conditional frequency distribution program, an analysis system for the study of local hourly weather data from a number of stations, was used successfully in its first operational run on single station data for Toronto International Airport. Another operational run was planned for local variability among the Toronto area stations and also a special application in connection with analysis of low-level wind shear data from a number of towers.

Micrometeorological Research

Air Pollution—Research is carried out in co-operation with a number of agencies including National Health and Welfare Occupational Health Division; Nova Scotia, New Brunswick, Quebec, Ontario, Manitoba, Saskatchewan, Alberta, Health Departments; Ontario Research Foundation; the St. Clair River Research Committee; and the cities of Hamilton, London and Vancouver.

Requests for advice and assistance increased during the year and a Meteorological officer was assigned on detached duty to the Occupational Health Division for better liaison.

At the Whiteshell Nuclear Research Establishment, 45 diffusion trials were completed, the resulting data being analysed during the winter months.

Turbulence—Development of a radio technique to study turbulent fluctuations of water vapour was started. Vertical anemometer system field trials were conducted at the Petawawa Forestry Station in May, and in August eddy correlation studies were carried out at Marmot Creek in connection with the Eastern Slopes (Alberta) Watershed Research Program.

Energy Budget—Construction of a micrometeorological system for use in energy budget studies began early in 1966. The system will consist of three 30-foot towers, each equipped to measure wind, temperature, and vapour pressure. Field projects were carried out at Petawawa and at the Marmot Creek watershed, and a study of the energy budget over fields of corn and grass at the Meteorological Research Station was planned.

Wind Wave Study—A sensing system for over-water meteorological observations was installed on a stabilized floating buoy platform at Superior Shoals, Lake Superior. About a month later, the platform structure failed in a storm and data recovery was only partially successful. Plans were immediately started for improved buoys, towers and instruments for two similar installations in 1966-67.

Considerable computer programming was accomplished in 1965.

Grants in Aid of Research

During the year, grants to Canadian universities in aid of meteorological research totalled \$110,000. Of 31 applications for 1966-67, the Advisory Committee recommended 18 for grants totalling \$125,000.

Meteorological Services for the Department of National Defence

Meteorological requirements provided the Department of National Defence included the operation of weather facilities in HMC ships and at most of the Canadian Forces bases in Canada and abroad. Some 140 meteorologists and meteorological officers were either seconded to DND or served on short-term commissions throughout the year.

Meteorological Training

Six meteorologists completed the M.Sc. course at McGill and were posted into operations in 1965.

Six students were posted to McGill in the fall of 1965 to commence the two-year M.Sc. course, three of whom were meteorological officers qualifying for the meteorological classification. Only three students were available for posting to the University of Toronto.

Seventeen students were in the second year of their Master's course during the year, nine of whom were at McGill and the rest at the University of Toronto.

A two-month advanced forecasting training course was conducted, attended by 19 students from the Universities of McGill and Toronto, two External Aid scholarship students, and a special student from the India Meteorological Service.

Meteorological Officers Course 22, which began in June, was attended by 30 general science students. Of these, 23 graduated in March, two of whom were accepted for the M.Sc. course at McGill.

The ninth annual Ice Observers Training Course was given at Meteorological Headquarters in May and June. Nine candidates successfully completed the course, eight of whom are carrying out ice observing duties. Nine observers received training in radar interpretation at the RCAF Navigation School, Winnipeg, in December, two participated in RCAF survival training in the spring of 1966; and three successfully completed courses at the RCAF School of Instructional Technique.

Instruments

The meteorological operational and research programs depend heavily on adequate instruments and associated technical services.

The development of an automatic weather station designed to report by teletype was completed. The station was thoroughly tested on an operational basis with complete success and specifications were drawn up for commercial procurement.

The runway visual range system was improved and a Canadian source for manufacturing this equipment was developed.

World Meteorological Organization (WMO)

Participation in the World Meteorological Organization included representation on all of the eight technical commissions and on 24 of its working groups and panels, and two staff members were re-elected presidents of WMO technical missions.

Some 185 scientists from more than 30 countries participated in the International Symposium on Design of Hydrometeorological Networks held in Quebec City, June 15-22, at the invitation of the Canadian Government. The symposium was sponsored jointly by WMO and the International Association of Scientific Hydrology.

Technical Assistance

Two staff members were made available for WMO technical assistance missions—an expert on meteorological telecommunications to assist the Government of Pakistan and a meteorological instructor to assist the Government of Libya. One staff member was granted leave of absence to accept a two-year post of technical

assistant to the Technical Division (Training Section) of the WMO Secretariat in Geneva. One expert was seconded through the Canadian External Aid Office to the Caribbean meteorological service to serve as meteorological adviser. At the end of the fiscal year, arrangements were being made to provide, under the WMO technical co-operation program, an expert in meteorological telecommunications to assist the Government of Iran.

The chief of the meteorological station network of the Israeli meteorological service visited Canada on a two-month WMO fellowship to study organization of station networks and ancillary subject matter. The head of the climatology division of the Ghana meteorological services, on a Canadian Government Commonwealth scholarship grant, completed post-graduate studies in meteorology leading to an M.Sc. at McGill University. Granted a WMO fellowship for specialized training in climatology, he used it for on-the-job training in the Branch.

Under External Aid sponsorship, several students—from India, Syria, Philippines, Malaysia and Ghana—received professional training at Canadian universities and in the Meteorological training section.

Under the continuing Canadian Government undertaking to supply equipment for machine processing to the Government of Nigeria and to train key personnel, two Nigerians received training in the Machine Processing Section of the Climatology Division and in the IBM training centre.

Through the External Aid Office, a radio-teletype transmitter and drive system was provided to the East African Meteorological Department, Nairobi, Kenya, under the Commonwealth Africa Aid Program, and a Canadian Kew-type station barometer to the Philippines Meteorological Service under the Colombo Plan.



CCGS *John Cabot*, icebreaking cable repair vessel.

MARINE SERVICES

Aids to Navigation

Lights—The electrification of lightstations program continued, with diesel-generated power being installed where commercial power was unavailable. Installations of the regular mercury vapour lamps having proved satisfactory, mercury vapour and other gaseous discharge lamps with additives for producing more white light are of continued interest, and any new types are tested for possible application.

Solid state electronic equipment for the control of automatic lights continue to replace mechanical devices at an increasing rate, and a standard specification is being prepared for a solid state flasher.

During the year, 125 new lights were established. This includes all types—coastal, range lights and minor wharf lights. Twenty-two lights were discontinued after surveys indicated that they no longer served a useful purpose.

Fog Signals—During the year, five new fog signals were established and two were discontinued. The smaller diaphones are being replaced by the more efficient air horn, and electrically-driven fog horns are used for ranges up to two miles.

Interest in the remote control of fog alarm stations is increasing, several are now in operation, and more effective, maintenance-free systems are continually being sought.

Two types of fog detectors which measure fog with the aid of an electric-light beam and a photo-electric cell are on trial.

Radio Beacons—The program to extend radio beacon coverage and to fill gaps in existing coverage continued, and the new beacons were placed in operation. The co-ordinated plan between Canada and the United States to establish a six-station sequenced system is nearly completed.

Radar Reflector Stations—Four shore-based radar reflector stations were established during the year.

Tabular Report of Aids to Navigation

Statement, by Districts, showing the Number of Lights, Lightkeepers, Caretakers, Lightships and Fog Signals for the Fiscal Year ended March 31, 1966.

District	Oil Vapour Lights	Oil Wick Lights	Commercial Electric Lights	Station Generated Electric Lights	Battery Electric Lights	Acetylene Lights	Total Lights	Lightkeepers	Caretakers of Automatic Lights	Lightships	Dialphones	Tysons	Whistles	Electronic Signals	Mechanical Bells and Gongs	Hand Fog Horns and Bells	Total Fog Signals
St. John's, Nfld.	11	31	44	24	166	117	393	240	152	..	57	1	3	..	..	..	61
Charlottetown, P.E.I.	14	17	112	1	213	7	364	56	182	..	9	2	..	..	..	6	17
Dartmouth, N.S.	4	12	130	20	77	4	247	120	105	1	23	9	1	6	..	8	47
Saint John, N.B.	..	1	137	18	33	2	191	101	92	1	24	7	21	..	1	..	53
Quebec, P.Q.	11	34	163	12	141	17	378	136	123	..	36	3	15	..	..	15	69
Sorel, P.Q.	..	..	77	..	149	..	226	..	152	..	..	..	..	..	..	..	..
Parry Sound, Ont. & Sub-Agencies.	..	..	199	22	327	15	563	45	126	..	24	4	6	5	1	4	44
Prescott, Ont.	..	..	134	5	204	1	344	85	51	..	14	6	6	4	3	2	35
Victoria, B.C.	..	..	66	26	383	3	478	75	14	..	28	13	7	6	5	30	89
Prince Rupert, B.C.	..	..	2	14	206	..	222	37	..	..	9	4	..	1	..	1	15
Hay River, N.W.T.	..	..	20	..	110	..	130	..	..	..	..	..	..	..	..	..	..
TOTAL	40	95	1084	142	2009	166	3536	895	997	2	224	49	59	22	10	66	430

Tabular Report of Aids to Navigation

Statement by Districts, showing the Number and Type of Buoys and other Markers for the Fiscal Year ended March 31, 1966.

District	Light Buoys	Sound Buoys	Light and Sound Buoys	Total Light and/or Sound Buoys	Floats, Cans, Conicals and Spar Buoys	Total Buoys	Unlighted Dolphins	Stakes, Bushes and Balises	Unlighted Day (Shore) Beacons	Total Unlighted Beacons, Stakes, etc.
St. John's, Nfld.....	58	..	30	88	163	251	...	8	62	70
Charlottetown, P.E.I.....	136	..	40	176	1099	1275	...	1838	7	1845
Dartmouth, N.S.....	76	19	172	267	1222	1489	4	78	29	111
Saint John, N.B.....	34	..	91	125	763	888	692	27	...	719
Quebec, P.Q.....	118	..	38	156	161	317	...	26	120	146
Sorel, P.Q.....	344	..	...	344	1254	1598	...	3	32	35
Parry Sound, Ont. & Sub-Agencies.....	114	1	15	130	1927	2057	...	...	397	397
Prescott, Ont.....	288	..	11	299	836	1135	...	125	2	127
Victoria, B.C.....	45	..	23	68	173	241	116	...	224	340
Prince Rupert, B.C.....	2	..	20	22	70	92	2	80	140	222
Hay River, N.W.T.....	20	..	...	20	434	454	...	38	885	923
TOTAL.....	1235	20	440	1695	8102	9797	814	2223	1898	4935

Buoys and Beacons—Approximately 10,000 buoys were maintained on coastal and inland waters, of which 1,676 were major buoys equipped with lights or sound devices, or both. Some 5,000 minor unlighted shore-based beacons, dolphins, stakes and other markers were maintained.

During the year, 257 new buoys of all classes and 34 day beacons were established, and 128 buoys were discontinued. Fifty-three buoys were fitted with radar reflectors, and a considerable number of existing lights were converted to mercury vapour. In some cases, a one-sector light replaced a “range of two lights”.

Distance Finding Facility—Because of the almost universal use of radar making the synchronized signal method of distance finding obsolete, six synchronizing units were taken out of operation during the year.

Lightships—The *Lurcher* and *Sambro* lightships operated during the year and investigation began for the replacement of the *Lurcher* by a pier light.

Construction

The design of two new lightpiers at Brule Bank in the St. Lawrence River and five new lightpiers in Lake St. Francis were completed.

Thirty-four new dwellings, 13 fog alarm buildings and three major lighthouse towers were constructed to replace obsolete lightstation structures and to provide additional dwelling accommodation. The dwellings were equipped with such conveniences as electric stoves, refrigerators and deep-freeze units in keeping with the continuing program of providing modern living accommodation.

A Sub-Agency depot building at Selkirk, Man., was completed, and Agency buildings at Prince Rupert, B.C. and a pilotage building in Victoria were ready for occupancy.

Tenders were called for new Agency buildings in Charlottetown, P.E.I., and buildings and wharves for Hay River, N.W.T. are under design.

Preliminary design studies are being prepared for projected work in various other locations.

Canals

Pleasure boat traffic on the secondary canals increased from 169,804 lockages in 1964 to 175,625 in 1965. The greatest increase was on the Trent, with 114,715 lockages compared with 108,747 last year.

The rehabilitation program for the Trent system continued. The third and final mechanical phase for the Peterborough lift lock was completed and the new Swift Rapids lock was officially opened on August 21.

The third stage for the Kirkfield lift lock commenced and, when completed, the new structure will include a wider underpass, a modern control house, and hydraulically operated aluminum gates.

The bascule bridge at Lindsay was replaced by a high-level bridge, owned and operated by the Town, and the operation and maintenance of the swing bridge at Dundas Street in Trenton was assumed by the corporation of the Town of Trenton.

At Heeley Falls, locks 16 and 17 were completely mechanized.

The Hydrographic Services of the Department of Mines and Technical Surveys conducted an extensive survey of the Trent system in preparation for publishing new navigation charts.

On the Rideau, work began on the mechanical rehabilitation of lock 36 at Newboro, which will include new steel gates, hydraulic operation of gates and valves, and the installation of new control circuits.

On the Carillon, mooring facilities at the lower and upper entrance were completed, and at Ste. Anne's, a new control building was provided and lower mooring facilities installed.

Pre-engineering studies for the construction of a new control dam on the St. Ours were completed.

Harbours and Property

Harbour Commissions—The new Harbour Commissions Act, which provided for the establishment of harbour commissions by Order in Council, was brought into use on April 1 with the establishment of the Fraser River Harbour Commission replacing the New Westminster Harbour Commissioners Act, 1913. Effective June 1, 1965, the new Act was also adopted by the Harbour Commissioners at Lakehead and Nanaimo, now established as the Lakehead Harbour Commission and the Nanaimo Harbour Commission respectively.

Cargo handled by harbour commissions totalled 52,063,000 tons. Of this total the Lakehead handled 17,633,000, followed by Hamilton with 10,502,000. North Fraser handled 6,674,000 tons and Toronto, 6,071,000.

Revenue earned amounted to \$8,492,000, an increase of \$1,437,000 over last year.

Public Harbours—In September, the harbour of Bonavista, Nfld., was proclaimed a public harbour. There are now 314 such harbours, of which 115 are under the supervision of harbour masters appointed by the Minister to enforce the Public Harbour Regulations.

Harbour dues collected totalled \$523,062, an increase of \$46,295 over the previous year.

Cargo handled in the ten major public harbours in 1965 totalled 50,568,000 tons. Of this, Sept Iles had 16,426,000 tons; Baie Comeau, 8,435,000; Sault Ste. Marie, 5,403,000; Sorel, 4,592,000; Sarnia, 4,175,000; Port Alfred, 3,321,000; Sydney and North Sydney, 3,057,000; Victoria, 2,405,000; Havre St. Pierre, 1,443,000; and Prince Rupert, 1,311,000.

Wharves—Of some 3,000 wharves, piers, and breakwaters under the administration of the Department, 509 are in charge of wharfingers. Wharf revenues amounted to \$1,797,643, a decrease of \$71,198 from the previous year.

Water Lots—At the end of the fiscal year there were 2,193 water-lot leases and licences in effect. Revenue from this source totalled \$675,171, an increase of \$192,294 over last year.

Steamship Inspection

Inspections of 1,872 Canadian registered ships, totalling 2,539,624 gross tons, were made. Of these, 502 were passenger ships totalling 314,963 gross tons. Inspections included 144 new ships built in Canada, 27 either converted or reconditioned, and 37 ships built outside Canada for registry in Canada. In addition, 51 ships registered elsewhere, totalling 396,703 gross tons, were inspected.

At the request of the St. Lawrence Seaway Authority, 149 inspections were made of ships reported to be damaged and their capability of making a safe passage through the Seaway was in doubt.

Eighteen accidents and 13 fatalities that occurred during the year in connection with loading and unloading ships were investigated.

Of 3,996 inspections of ships cargo handling gear, 396 cases required repairs, adjustments or testing. In addition, all docks having loading or discharging facilities in the major ports were checked regularly.

The construction of a 75-ton lifting capacity marine haulout at Lewisporte, Nfld., was completed and handed over to the Province of Newfoundland for operation.

Water Safety

Recommended safe load and capacity plates issued to individuals during the year totalled 6,972, and 29,310 were issued in bulk quantities to boat manufacturers and distributors.

Some 335,000 copies of the booklet, *Safety Afloat*, were distributed to the boating public.

Water Pollution

Helicopter and aircraft patrols over the St. Lawrence River, Lake Ontario and Lake Erie were conducted during the navigation season to check on pollution on the waters by oil. Eleven prosecutions for violations of the Oil Pollution Prevention Regulations were made, convictions resulting in all cases.

Marine Engineering Training and Examinations

Under the Department's marine engineer training scheme, two trainees completed their four-year shipyard training, obtained fourth class certificates of competency and joined the Canadian Coast Guard as junior engineer officers.

Since the inception of the scheme, 13 men have joined the Coast Guard and seven of these have obtained second class certificates of competency of United Kingdom validity. One trainee remains, who is completing his final year.

Candidates for certificates of competency as marine engineers totalled 1,086, of which 877 were successful and 209 received partial passes. There was one electrical endorsement, and 756 permits were issued permitting individuals to act as engineers on ships under the provisions of the *Canada Shipping Act*.

Revenue

Revenue collected, including inspection services, examination fees and fines, totalled \$246,348.

Conferences

In March, the department was represented at the International Load Line Conference held in London, England, which resulted in the 1966 Load Line Convention, and at six meetings of the Maritime Safety Committees of the Inter-Governmental Consultative Organization held in London at various times.

The Technical Committee on Dangerous Goods and the Inter-Departmental Advisory Committee held two full and six special meetings.

Ship Registration

Small vessels exempt from registration and licensed under the *Small Vessel Regulations* totalled 50,151, making a grand total of 619,205 such vessel licences issued throughout Canada up to December 31, 1965. During the same period, 1,735 vessels were added to the Canadian registry and 722 were removed, making a net increase of 1,013. At the end of December 1965, there were 24,731 vessels totalling 3,267,251 gross tons registered in Canada.

In accordance with the British Commonwealth Merchant Shipping Agreement, the Registrar General of Shipping and Seamen in the United Kingdom was supplied with information on approximately 8,737 separate transactions, such as registry, re-registry, transfers and transmissions of ownership, mortgages and changes of name, together with details of all vessels registered during this period. This information is used in compiling the *Mercantile Navy List and Maritime Directory*, which shows particulars of vessels registered in the Commonwealth.

Revenues from various types of registry transactions totalled \$20,387.

In addition, 1,590 tonnage measurements forwarded to headquarters by district measuring surveyors were checked and seven vessels were measured for tonnage. A total of \$16,814.25 was realized in fees charged for measurements.

Live Stock Shipments

During the 1965 navigation season, 13,375 head of live stock were shipped from Saint John, Montreal and Vancouver to ports abroad under the supervision of the department's Inspector of Live Stock Shipments on ships fitted as prescribed by the Live Stock Shipping Regulations.

Pilotage

There were 385 licensed pilots engaged in the nine districts for which the Minister is the pilotage authority—Sydney, Bras d'Or Lakes, Halifax, Saint John, Quebec, Montreal, Cornwall, British Columbia, and Churchill.

They performed 39,018 pilotages inward or outward and 13,709 movages, grossing \$6,848,760.85 in fees.

Pilotage in the districts of Cornwall to Kingston, Port Weller to Sarnia, and the Lakehead and St. Mary's River is carried out as a joint operation between Canadian and United States authorities.

Cornwall to Kingston—Twenty Canadian pilots performed 3,143 pilotages, netting \$376,248.30 in fees.

Port Weller to Sarnia—Forty-two pilots performed 3,995 pilotages, netting \$716,695.99 in fees.

The Lakehead and St. Mary's River—Three pilots employed to conduct ships through the St. Mary's River and into ports on Lakes Huron, Michigan and Superior netted \$59,189.83 in fees.

Labrador—Two pilots were employed by the Department to assist ships in and out of Goose Bay as required during the season of navigation.

Marine Casualties

Twenty-five preliminary inquiries were made into marine casualties under the *Canada Shipping Act*, and there were four formal investigations.

Royal Commission on Pilotage

The Royal Commission on pilotage, appointed in November 1962 to enquire into and report upon the problems relating to marine pilotage in Canada, concluded its hearings during 1965.

Masters, Mates and Seamen

Nautical examinations held during the year totalled 3,577. Certificates issued included 1,031 master, 91 first mate, 62 second mate, 36 able seamen, 9 ships' cooks, 388 lifeboatmen, and 374 certificates of qualification for the Great Lakes. Examination fees collected totalled \$16,994.

Fines and deserters' wages deposited with the Receiver General of Canada amounted to \$3,242.

During the year there were 40,017 engagements and 38,017 discharges of seamen at 107 Canadian ports.

Marine Hydraulics

Hydraulic Engineering Studies and Research—The hydraulics laboratory in Lasalle, P.Q., was extended to provide accommodation for additional hydraulic model facilities required to investigate and study hydraulic problems related to navigation improvements downstream of Montreal. The new extension, measuring 250 feet by 95 feet, was completed early in December.

In September 1965 a contract was awarded for the construction and testing of an hydraulic model of the Lanoraie to Becancour reach of the St. Lawrence River. An extension of the existing model, hydraulic testing of improvement proposals for the complete reach from Montreal to below Trois-Rivieres can now be carried out. The models now reproduce some 88 miles of the St. Lawrence River below Montreal.

A co-ordinate program was approved for tidal hydraulics study and research of the St. Lawrence River downstream of Montreal, including investigations with the use of mathematical and physical river models reproducing tidal phenomena. The National Research Council has undertaken to construct a physical model of the St. Lawrence and this work was started in 1966.

During the year, various hydraulic research establishments in Holland, France and the United Kingdom were visited to gain information on the latest developments and techniques used in the field of tidal hydraulics, and to discuss the application of such techniques to departmental studies.

In conjunction with the International Joint Commission, a feasibility study of the improvement of the Champlain-Richelieu system was completed at the end of 1965 and the final report will be made by the Commission. The work of the International Great Lakes Levels Board, on which the department is represented, continued and its report on the possibilities of regulating the Great Lakes further is to be completed by the end of 1970. The department is also represented on the

International Joint Commissions' St. Lawrence River Board of Control in supervising the St. Lawrence Project as it relates to water levels and the regulation of Lake Ontario.

Regulation of Lake Ontario—Due primarily to increased precipitation on the Great Lakes-Ottawa River basin throughout the fall of 1965, water levels for navigation for that period and for the beginning of the 1966 navigation season were materially improved over the previous year. Levels rose above datum in Montreal Harbour in mid-August 1965 and remained above for the rest of the season. Maximum permissible Seaway draft of 25' 6" for the Welland and St. Lawrence canals was maintained throughout the season.

St. Lawrence Ship Channel—During the navigation season, five survey and inspection vessels were engaged in channel maintenance and improvement below Montreal, and in addition, two maintenance units worked in the non-canal reaches above Montreal.

An extensive soils exploration program was completed in the Lake St. Peter area in relation to the feasibility of a scheme to straighten the channel through the lake.

The two-year contract for 800-foot widening between Batiscan and Cap a la Roche was completed and a three-year contract was awarded for 800-foot widening between Montreal East and Vercheres. At the season's end Point-aux-Trembles was 47% completed, Varennes, 20%, and Cap St. Michel-Vercheres, 42%.

Reconstruction of the Sorel weirs was about two thirds completed.

A two-year contract for dredging a turning area at Port St. Francis was nearly completed, and normal depths at Cap Brule and East Narrows below Quebec and opposite Batiscan and St. Ignace above Quebec were restored by dredging.

Work carried out for the National Harbours Board included maintenance sweeping in Montreal Harbour, at all berths in Trois-Rivieres Harbour and in the St. Charles River and Wolfe's Cove in Quebec Harbour.

Ice reporting from shore in the Montreal-Quebec reach of the St. Lawrence River was carried out under the supervision of the Ship Channel by arrangement with the Nautical and Pilotage Division.

Canadian Coast Guard

The *John Cabot*, a twin screw diesel-electric icebreaking cable repair ship, was a major addition to the fleet during the year. The ship is now based at St. John's, Nfld. The small tender, *Abraham Martin*, was disposed of as being obsolete.

The fleet consists of 190 craft of the following types: full icebreakers, 10; light icebreaker, supply and buoy vessels, 8; icebreaker-cable repair ship, 1; lighthouse supply and buoy vessels, 11; special Arctic service vessel, 1; northern supply vessels, 6; northern service depot ship, 1; St. Lawrence Ship Channel vessels, 5; lightships, 3; weatherships, 3; Mackenzie River shallow draft vessels, 4; Great Lakes limnology and meteorological research, 1; shore-based lifeboats, 3; Agency tenders, 9; rescue cutters, 10; steel landing craft, 2; landing craft and barges at Agencies, 71; steel landing craft and barges at northern sites, 41.

These ships are under the administration of the 11 Marine Agencies and the St. Lawrence Ship Channel.

Northern Operations

The annual Arctic resupply operations delivered 107,301 short tons of cargo to more than 60 ports of call. In addition, existing aids to navigation were serviced throughout the area, a number of new ones were established, and direction finding stations were calibrated.

The cargo consisted, for the most part, of construction and repair equipment, machinery, vehicles, medical and food supplies and heating oil. The ships also provided assistance for hydrographers and oceanographers of the Canadian Hydrographic Service and for Defence Research Board scientists.

CCGS *C. D. Howe* carried out her sixteenth annual Eastern Arctic Patrol on behalf of the Departments of Northern Affairs and National Health and Welfare, bringing medico-dental services to many settlements throughout the Eastern Arctic. The Victoria based icebreaker CCGS *Camsell* passed Point Barrow on July 23, after being held up by ice in the vicinity for seven days, and commenced her activities in the Western Arctic. She provided escort and other assistance to vessels as far east as Spence Bay, as well as servicing both floating and fixed navigation aids. She returned to Victoria on October 2, having steamed a total of 10,804 miles in the course of her operations.

Merchant ships in the Churchill grain trade were assisted by icebreakers, both in the Hudson Bay and Strait. The first ship arrived on July 27 and the last ship, the forty-seventh of the season, departed October 16. A Canadian Coast Guard icebreaker remained in Hudson Strait until the last ship from Churchill had passed safely through the Strait into the open waters of the Labrador Sea.

Ice conditions on the Churchill route were about average, as they were throughout the Arctic, and no serious difficulties were encountered.

Winter Icebreaking

The ice operations office at Sydney, N.S., commenced its sixth season on December 15. From then until April 15, 572 ships were assisted and routed through the area. Because of the relatively mild conditions that prevailed throughout the area, many ships passed through without requiring assistance.

Four icebreakers opened a channel up to Montreal upper harbour by January 25. The channel was maintained throughout the winter with the exception of local ice jams within the Montreal to Lake St. Peter area. Water level in Montreal Harbour reached an elevation of 14' 4" above chart datum on January 19, then gradually declined through icebreaking operations and partial ice cover of Laprairie Basin.

In the Saguenay River, three icebreakers worked intermittently from March 8 to March 23. On March 14, icebreaking above Montreal started and extended up to Lake St. Francis.

On April 14, 1965, CCGS *d'Iberville* reached Goose Bay Narrows, Labrador, having smashed through ice varying in thickness from 26 to 48 inches in Hamilton Inlet and Lake Melville.

The department's publication, *Guidance to Merchant Ships Navigating in Ice in Canadian Waters*, was again widely distributed throughout the marine industry.

Great Lakes Research

CCGS *Porte Dauphine* continued its operations on a full-time basis for the Great Lakes Institute and the Meteorological Branch in scientific research.

Weatherships

CCGS *Stonetown* and *St. Catharines* continued their patrols of ocean weather station "P" in mid-Pacific on an alternating basis.

Search and Rescue

Under the overall administration of the Royal Canadian Air Force, the Coast Guard rescue officers attached to the Rescue Co-ordination Centres at Halifax, Trenton and Vancouver, controlled the operations of the Coast Guard rescue cutters and provided the marine liaison for the search and rescue organization.

Coast Guard rescue officers continued to maintain a close liaison with the public concerning the various aspects of water safety, and with the commercial fishing industry and pleasure boating public in particular.

Volunteer rescue agents assisted in covering the vast areas of water throughout the country and of the thousands of miles of coast line on the East and West Coasts.

Training

The Canadian Coast Guard College at Point Edward, N.S. opened in September 1965 with some 40 cadets enrolled. Approximately this number will be recruited each year and it is expected that the total number of cadets at the College in its fourth year will be 120. Upon leaving the College after the four-year course, the cadets will serve in Canadian Coast Guard ships as junior deck and engine room officers and will serve their qualifying time in that capacity before moving to positions of greater responsibility in the Coast Guard.

Thirteen Coast Guard ships' officers attended a three-week navigation/radar course at H.M.C. Stadacona, Halifax, N.S.

The Central Region Coast Guard rescue officer gave a one-week course in search and rescue techniques, attended by 20 masters and deck officers.

At Quebec and Victoria, 18 crew members were trained in scuba diving, and 50 crew members were enrolled in the correspondence course for First Mate, Home Trade.

First aid training was given to officers and men by National Health and Welfare doctors on board Coast Guard ships during the Arctic operations. Other ships' employees at Dartmouth, N.S. were trained in first aid by the St. John Ambulance.

Ship Construction

During the fiscal year the CCGS *John Cabot* was completed, 13 ships were under construction, and 23 were in the design stage.

Vessels under construction were the two weatherships, *Vancouver* and *Quadra*; a triple screw icebreaker for service in the Maritimes and northern areas; a replacement vessel for the *Chesterfield* and *Saurel* for service in Quebec; an icebreaking supply and buoy vessel for St. John's, Nfld. and the Gulf of St. Lawrence; replacement vessels for the *Safeguarder* and the *Frontenac*; a ferry for CNR service between

Nova Scotia and the east coast of Newfoundland; a ferry for the CNR Prince Edward Island service; a ferry for CNR service between North Sydney, N.S. and Port aux Basques, Nfld.; a pilotage vessel for service at St. John's, Nfld.; a pelagic fisheries vessel, *E.E. Prince*, for the Fisheries Research Board; and the Fisheries Department protection vessel, *Chebucto*.

In the design stage were six search and rescue vessels for service on the East and West Coasts; replacement vessels for the *Grenville*, *Brant*, *Detector*, *Estevan*, *Parry Sound*, and *C.P. Edwards*; a tender for the Saint John River; three supply vessels for northern operations; a tender for the Lakehead; a 67-foot survey/work-boat for the St. Lawrence Ship Channel; a tender for Amherstburg, Ont.; two pilot boats for service in Sydney, N.S., and Prince Rupert, B.C.; and a protection vessel for the Fisheries Department.

A major refit and conversion of the auto ferry *Lief Ericksson*, formerly *Prins Bertil*, was carried out for CNR service between North Sydney, N.S. and Port aux Basques, Nfld.

Repairs

Under the supervision of the Ship Construction Branch, repairs totalling \$3,704,757 were carried out on departmental ships, and alterations and additions totalled \$897,563.

RAILWAY SERVICES

Canadian National Railways

Canadian National Railways operated at a deficit of \$33,414,884 in the calendar year 1965, compared with a deficit of \$38,725,904 the previous year.

Air Canada

Air Canada operated at a profit of \$3,989,960 in 1965, compared with a profit of \$1,405,575 in 1964, a gain of \$2,584,385.

Prince Edward Island Ferry and Terminals

The deficit in the operations of this service for the calendar year 1965 totalled \$4,208,451, compared with \$3,978,806, in 1964, an increased deficit of \$229,645.

In the fiscal year 1965-66, payments made on ferry construction amounted to \$1,589,715, and dock construction totalled \$75,512 for Borden and \$54,391 for Cape Tormentine.

Vehicle traffic increased 11.2% from 237,560 in 1964 to 265,778 in 1965. Freight decreased from 906,805 tons in 1964 to 895,360 tons in 1965, and passengers increased from 587,515 in 1964 to 655,944 in 1965.

Newfoundland Ferry Service

In addition to the regular North Sydney-Port aux Basques service, a freight service only is operated from North Sydney to various other Newfoundland ports. Construction started 1964 on the terminal requirements and a vessel for a new vehicle and passenger service to operate to Argentia, Newfoundland.

The deficit in the operation of this service amounted to \$12,368,009 in 1965, compared with \$11,086,937 for 1964, an increase of \$1,281,072.

Yarmouth, N.S.-Bar Harbor, Me. Ferry Service

Traffic handled by this service in 1965 consisted of 93,430 passengers, 27,688 cars, 3,312 trucks and 1,051 other vehicles, compared with 88,211 passengers, 25,886 cars, 3,147 trucks and 803 other vehicles for 1964.

Maritime Freight Rates Act

Payments made under this Act during 1965-66 amounted to \$15,054,696, compared with \$14,724,861 last year, an increase of \$329,835.

Supplemental Pension Allowances

Supplemental pension allowances payable by the Government of Canada to retired former Newfoundland railway, steamship and telecommunication employees amounted to \$252,132, compared with \$195,000 for the same period last year.

Victoria Jubilee Bridge

The annual operating costs for this bridge amounted to \$805,495 in 1965.

Great Slave Lake Railway

This line is expected to be mainly completed by December 31, 1966. Accountable advances for 1965-66 amounted to \$9,666,000, bringing the total advance to date to \$68,225,000.

FINANCIAL SUMMARY

Comparative Summary of Expenditures and Revenues for the Fiscal Years Ended March 31, 1965 and 1966

Millions of Dollars

	1965-66	1964-65	Increase (+) or Decrease (-)
<i>Administration, Operation and Maintenance Expenditures</i>			
Departmental Administration.....	4.4	4.2	.2 (+)
Air Services.....	100.5	91.3	9.2 (+)
Marine Services.....	44.5	39.3	5.2 (+)
Railway and Steamship Services.....	76.3	93.8	17.5 (-)
Miscellaneous Services.....	171.6	152.6	19.0 (+)
General.....	.2	2.4	2.2 (-)
	<u>397.5</u>	<u>383.6</u>	<u>13.9 (+)</u>
<i>Capital Expenditures</i>			
Air Services.....	42.5	40.4	2.1 (+)
Marine Services.....	40.0	25.2	14.8 (+)
Railway and Steamship Services.....	23.8	10.2	13.6 (+)
Miscellaneous Services.....	.1	—	.1 (+)
	<u>106.4</u>	<u>75.8</u>	<u>30.6 (+)</u>
TOTAL DEPARTMENTAL EXPENDITURES.....	<u><u>503.9</u></u>	<u><u>459.4</u></u>	<u><u>44.5 (+)</u></u>
<i>Revenues</i>			
Air Services.....	29.3	28.0	1.3 (+)
Marine Services.....	6.5	8.8	2.3 (-)
Railway and Steamship Services.....	.5	.5	—
Miscellaneous Services.....	9.6	43.2	33.6 (-)
	<u>45.9</u>	<u>80.5</u>	<u>34.6 (-)</u>

EXPLANATION OF INCREASES AND DECREASES

Administration, Operation and Maintenance Expenditures

Departmental Administration—With effect from April 1, 1965, the Purchasing Establishment of the Purchases, Contracts and Stores Division was transferred to the Department of Defence Production. The estimated expenditures on this establishment from the appropriation for departmental administration during 1964-65 was \$194,000. However, increases in several expenditure categories resulted in a net rise of \$0.2 million.

Air Services—The Airports and Field Operations Branch was established during the year. This function had formerly been included in the Civil Aviation Branch. The new branch reported an increase in expenditures of \$2.3 million due in part to the growth of airports and associated facilities. The Civil Aviation, Telecommunications and Electronics and Meteorological Branches showed added costs of \$0.7, \$3.2 and \$2.3 millions respectively. General administration and administration of the Construction Branch contributed \$0.7 million to the overall increase of \$9.2 million although expenditures for Air Services Administration during 1964-65 included approximately \$148,000 for the transferred Purchasing Establishment.

Marine Services—Expenditures of Marine Services in this category were \$44.5 million compared with \$39.3 million the previous year. Expenditures for the Marine Works Branch increased from \$9.8 to \$12.1 million, of which \$781,000 was attributable to contributions and payments in connection with or towards the cost of repairs, operation or maintenance of certain canal property and facilities transferred pursuant to the Public Lands Grant Act. Other increases were: Marine Regulations Branch \$0.6, Marine Hydraulics Branch \$0.2 and Marine Operations Branch \$2.0 millions respectively. Expenditures for Headquarters and Agency administration were up by \$0.1 million over 1964-65. Figures for that year included approximately \$87,000 for the Purchasing Establishment transferred to the Department of Defence Production on April 1, 1965.

Railway and Steamship Services—There were reductions of \$5.3 million in the amount required to meet the deficit of the Canadian National Railways and of \$14.4 million in the subsidy for the construction of a railway to Great Slave Lake, compared with corresponding items in the fiscal year 1964-65. These reductions were somewhat offset by increases of \$1.4 million in the deficits on ferry operations, \$0.3 million in payments made under the Maritime Freight Rates Act and by a contribution to the Province of New Brunswick of \$450,000 towards the cost of construction or rebuilding the Moncton-Buctouche Highway related to the abandonment of the CNR Buctouche branch line.

Miscellaneous Services—The principal variations from expenditures in the previous year were increases of: \$18.9 million in payments under the Freight Rates Reduction Act, \$8.9 million to the Railway Grade Crossing Fund, \$8.5 million in

capital subsidies for construction of commercial and fishing vessels, \$1.1 million in steamship subventions for coastal services and a decrease of \$18.9 million in the payment to the St. Lawrence Seaway Authority to cover the deficit of the Welland Canal. The 1964-65 payment had covered the accumulated deficits from 1959 to 1964.

General—The reduction of \$2.2 million in refunds of amounts credited to revenue accounts for the change in this category. During 1964-65, refundable Air Route Facility Fees totalling \$2,248,000 had been charged to the statutory item provided for this purpose. The corresponding amount in 1965-66 was \$43,000.

Capital Expenditures

Air Services—Investment expenditures on national airports were up a nominal \$2.3 million while those of the Telecommunications and Electronics Branch rose by \$0.1 million. The Meteorological Branch showed a decline of \$0.4 million. Equipment for the Construction Branch amounted to \$193,000 compared with \$107,000 during 1964-65.

Marine Services—The construction of modern office, stores and shop buildings, agency depot facilities, buildings, required by the Lighthouse Service, including lightkeepers' dwellings and the construction or acquisition of equipment, resulted in an increase of \$2.4 million in the expenditures with respect to Aids to Navigation. Expenditures on the construction of ships and acquisition of helicopters for the Canadian Coast Guard were \$24.0 million compared with \$14.8 in the previous year. The Marine Hydraulics Branch incurred additional capital expenditures of \$2.8 million while Canals were up \$0.4 million.

Railway and Steamship Services—Expenditures on construction or acquisition of passenger-cargo vessels and equipment and on dock and terminal facilities in the Atlantic provinces were up from \$10.2 million in 1964-65 to \$23.8 million in 1965-66.

Miscellaneous Services—The capital requirements of canals entrusted to the St. Lawrence Seaway were \$110,000 compared with \$8,000 the previous year.

Revenues

Air Services—Revenues of the Airports and Field Operations Branch which were up \$1.3 million to a total of \$23.9 million accounted for the increased revenues in Air Services. However, it must be pointed out that the revenues for 1964-65 included \$2.0 million in landing fees which had been abated while the collection of the Air Route Facility Fee was in effect, while those of 1965-66 included only \$58,000. Revenues collected during the year and attributable to the Civil Aviation, Telecommunications and Electronics and Meteorological Branches remained constant at \$0.2, \$4.7 and \$0.3 millions respectively.

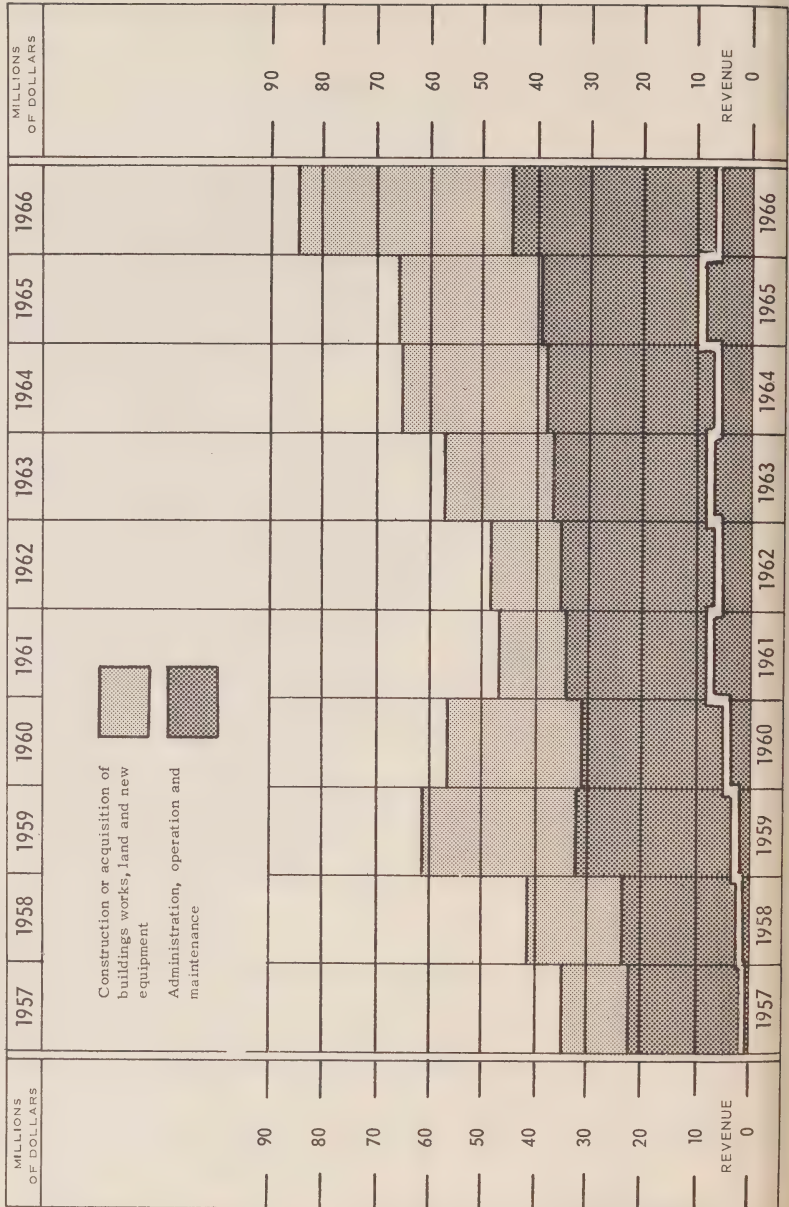
Marine Services—Receipts from earnings of the Canadian Coast Guard, arising from northern supply operations declined by \$2.5 million while revenues of the Pilotage Service were up \$0.2 million.

Miscellaneous Services—Interest payments by the St. Lawrence Seaway Authority were \$9.4 million compared with \$43.1 million in 1964-65.

EXPENDITURES AND REVENUES FOR THE FISCAL YEARS 1956-57 TO 1965-66 INCLUSIVE

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DEPARTMENT OF TRANSPORT
MARINE SERVICES EXPENDITURES AND REVENUES
FOR THE FISCAL YEARS 1956-57 TO 1965-66 INCLUSIVE

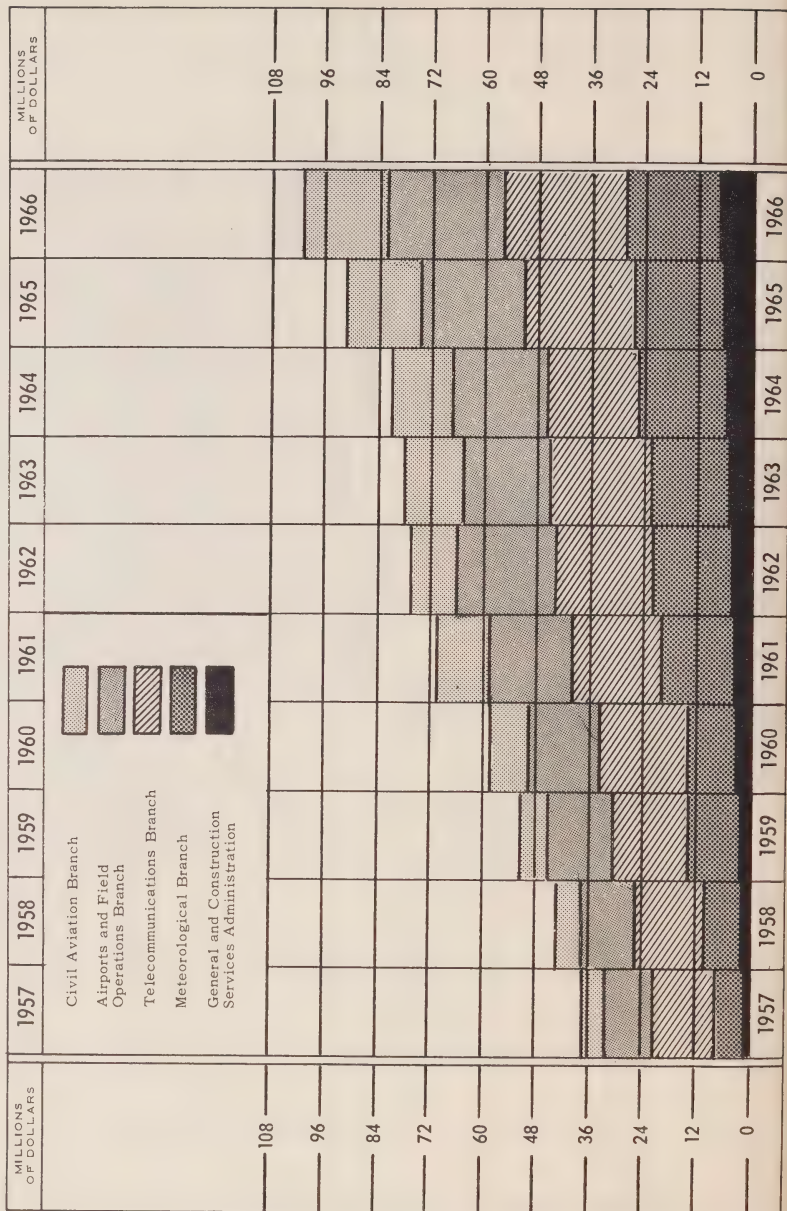


RAILWAY AND STEAMSHIP SERVICES
EXPENDITURES FOR THE FISCAL YEARS 1956-57 TO 1965-66 INCLUSIVE

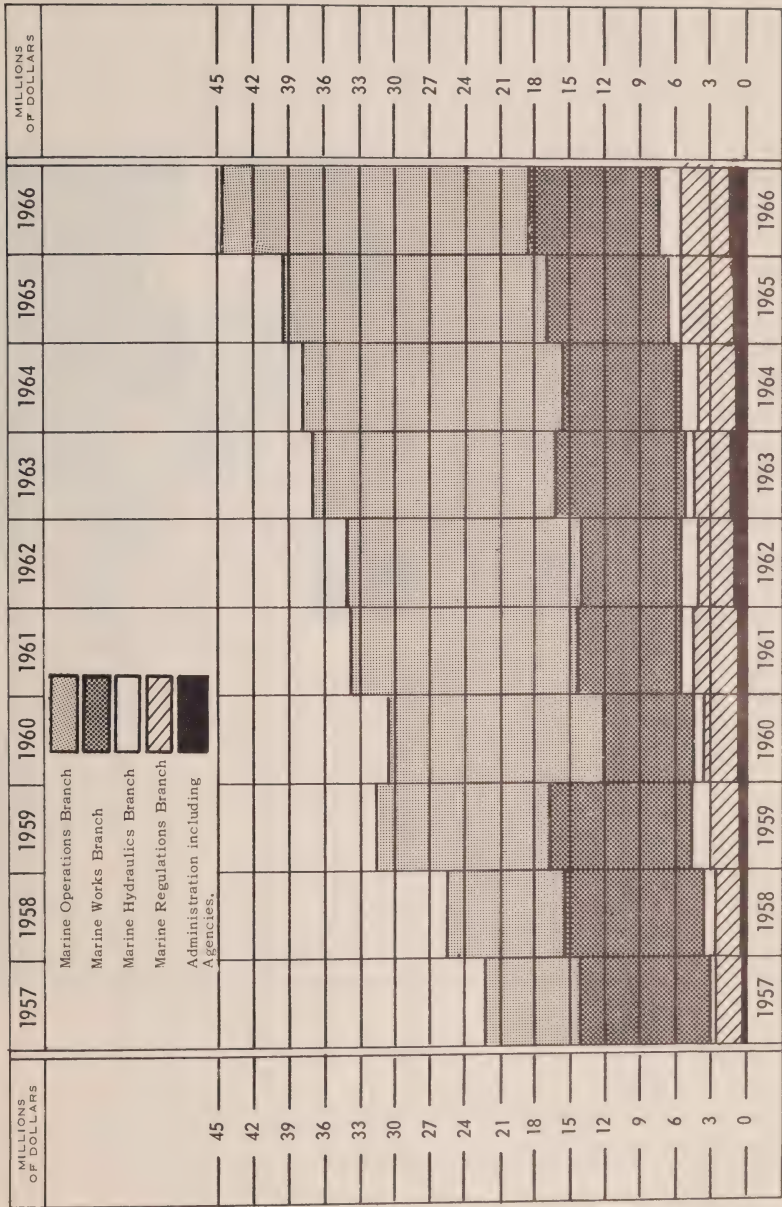
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DEPARTMENT OF TRANSPORT

**AIR SERVICES-ADMINISTRATION OPERATION AND MAINTENANCE EXPENDITURES
FOR THE FISCAL YEARS 1956-57 TO 1965-66 INCLUSIVE**



DEPARTMENT OF TRANSPORT

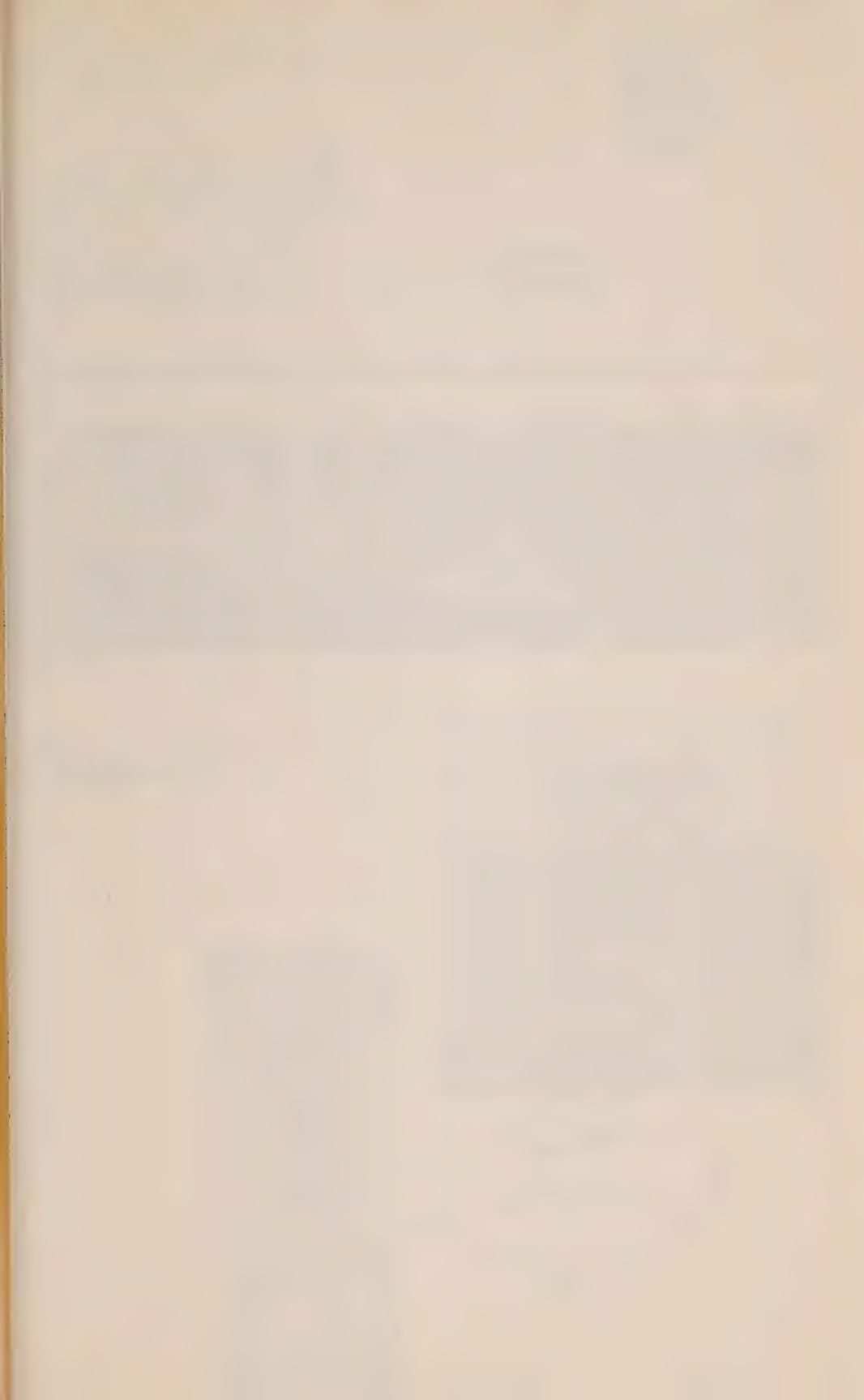
MARINE SERVICES-ADMINISTRATION OPERATION AND MAINTENANCE EXPENDITURES
FOR THE FISCAL YEARS 1956-57 TO 1965-66 INCLUSIVE

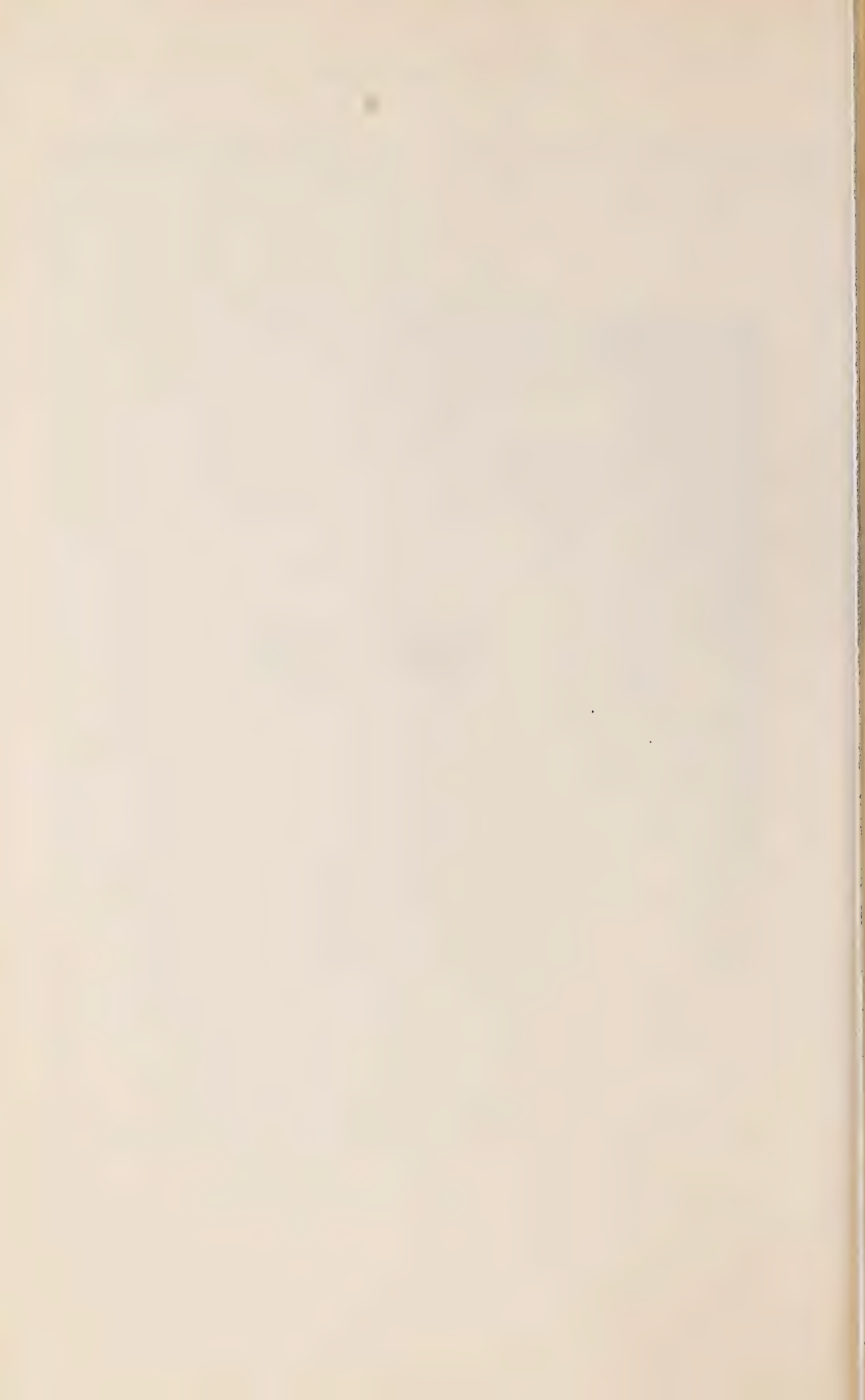
DEPARTMENT OF TRANSPORT
MISCELLANEOUS SERVICES – EXPENDITURES
FOR THE FISCAL YEARS 1956-57 TO 1965-66 INCLUSIVE

MILLIONS OF DOLLARS	1957	1958	1959	1960	1961	1962 ⁽²⁾	1963 ⁽²⁾	1964 ⁽²⁾	1965 ⁽²⁾	1966 ⁽³⁾	MILLIONS OF DOLLARS	
	<div><div><div></div><div></div><div></div><div></div><div></div><div></div><div></div></div><div>Railway Grade Crossing Fund Payments to C.P.R. and C.N.R. re Maintenance of Trackage Contrib. re Freight Rates Reduction (began 1959-1960) St. Lawrence Seaway Authority Entrusted Canals Proceeds of Property Sales paid into C.R.F. Deficit Welland Canal⁽¹⁾ Canadian Maritime Commission - Steam- ship Subventions and Assist. for Canadian Shipp'g and Ship Building Industries, Admin. Oper. and M'tce expenses of A.T.B., B.T.C., and C.M.C., expenses of Royal Commissions and Enquiries.</div></div>											
108											108	
96											96	
84											84	
72											72	
60											60	
48											48	
36											36	
24											24	
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(1) Payment in 1964-65 covered accumulated deficits 1959-64.

(2) Does not include yearly payments of \$50,000 for freight rate maintenance.



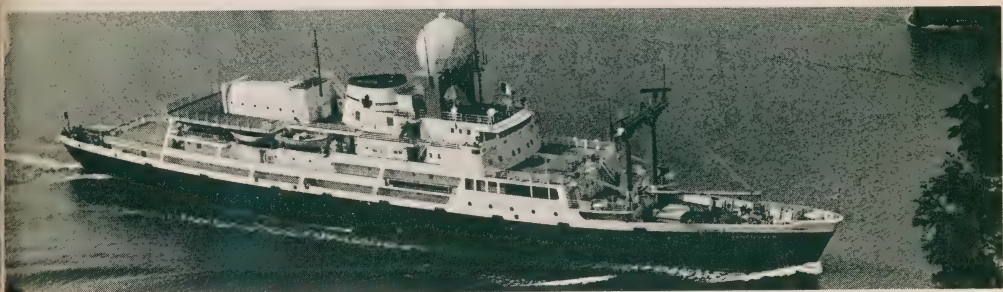


DEPARTMENT OF TRANSPORT
OTTAWA

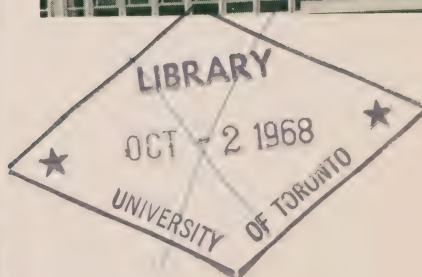


ANNUAL REPORT

Government
Publications



966-67





DEPARTMENT OF TRANSPORT

ANNUAL REPORT

FOR THE FISCAL YEAR ENDED

MARCH 31

1967

Submitted Under the Provisions of the
DEPARTMENT OF TRANSPORT ACT



*To His Excellency the Right Honourable Roland Michener, P.C., Q.C., Governor
General and Commander-in-Chief of Canada*

MAY IT PLEASE YOUR EXCELLENCY:

The undersigned has the honour to present to Your Excellency the Annual Report of the Department of Transport for the fiscal year ended March 31, 1967.

PAUL T. HELLYER,
Minister of Transport

ACTS, AND BOARDS, COMMISSIONS AND CROWN-OWNED COMPANIES ADMINISTERED BY

MINISTER OF TRANSPORT

Boards, Commissions and Crown-Owned Companies

Air Canada
Atlantic Development Board
Canadian National Railway Company
Canadian Overseas Telecommunication Corporation
Canadian Transport Commission
National Harbours Board
St. Lawrence Seaway Authority
Steamship Inspector Board

Acts

GENERAL

Bills of Lading Act
Canadian Overseas Telecommunication
Corporation Act
Department of Transport Act
Government Property Traffic Act
Telegraph Act
Transport Act
National Transportation Act

AIR SERVICES

Aeronautics Act
Carriage of Goods by Air Act
Foreign Aircraft Third Party Damage
Radio Act
Air Canada Act

MARINE

Belleville Harbour Commissioners Act
Canada Shipping Act
Canadian National Steamships Act
Canadian Vessel Construction Assistance
Government Harbours and Piers Act
Government Vessels Discipline Act
Hamilton Harbour Commissioners Act
Harbour Commissions Act

Live Stock Shipping Act
National Harbours Board Act
Navigable Waters Protection Act
North Fraser Harbour Commissioners Act
Port Alberni Harbour Commissioners Act
St. Lawrence Seaway Authority Act
Toronto Harbour Commissioners Act
Trenton Harbour Act
Water Carriage of Goods Act
Windsor Harbour Commissioners Act
Winnipeg and St. Boniface Harbour Com-
missioners Act

RAILWAYS

Canadian National Railways Act
Canadian National-Canadian Pacific Act
Canadian National Railways Financing
and Guarantee Act
Canadian National Montreal Terminals
Act
Canadian National Railways Pensions Act
Canadian National Toronto Terminals
Act
Government Railways Act
Intercolonial Railway and P.E.I. Railway
Employees Provident Fund Act
Maritime Freight Rates Act
Railway Act

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One of two modified DC-4 aircraft used by the Department for ice survey work in coastal waters and on the Great Lakes.

AIR SERVICES

Airports

Development—Planning and feasibility studies of future airport requirements at Montreal, Toronto, Windsor, Winnipeg, Calgary and Vancouver were undertaken and engineering reports prepared on the proposed development of airport facilities at these sites.

Arrangements were made to investigate and select suitable locations for the construction of landing strips at 26 remote northern sites for the Department of Indian Affairs and Northern Development. An evaluation of areas at 19 of these sites was carried out during the year, and topographic surveys were completed at 11 of them. All projects are scheduled for completion in a 10-year period.

Planning and Contracts—Master plans were completed for Halifax, Ottawa and Victoria International airports, and work is continuing on the preparation of commercial development and land use plans.

Projects were developed for the construction and strengthening of runways, taxiways, aircraft aprons, car parking facilities and roadways, and major contracts

were awarded at St. John's, Nfld.; Sydney, N.S.; Bathurst and Moncton, N.B.; Bagotville, Drummondville and Quebec, P.Q.; Regina, Sask.; Campbell River, East Kootenay, Pitt Meadows and Vancouver, B.C.; and Hay River, N.W.T.

Construction contracts were completed for airfield facilities at Gander, Nfld.; Sydney, N.S.; Moncton, N.B.; Sept-Îles and Montreal, P.Q.; Ottawa, St. Catharines, Waterloo-Wellington, and Earlton, Ont.; Yorkton, Sask.; Abbotsford, Dawson Creek, Pitt Meadows, Prince George and Vancouver, B.C. and Cambridge Bay, N.W.T.

Design—Pavement designs were prepared and evaluations performed on pavement structures used for aircraft operations, and samples of pavement construction materials were received for testing for compliance with specifications. Field investigations included pavement load testing, roughness and skid resistance testing and frost penetration measurements.

Special projects undertaken included feasibility studies for the development and expansion of airport facilities at a number of Caribbean Islands; a study of computer requirements in the Construction Engineering and Architectural Branch; the development of geometrical standards for airports; a survey of quality control procedures employed during construction by the provincial highways departments; an investigation into the effect on stability of the crushed content in base course material; and the effect of aircraft antifreeze on the deterioration of concrete.

Power and Lighting—Visual landing aids facilities were provided at Katunayake, Ceylon; Sept-Îles, Bagotville, and Montreal, P.Q.; Ottawa, St. Catharines, Toronto and Toronto Island, Ont.; and Winnipeg, Man.

The development of a suitable indoor lighting regulator was completed and investigations continued on the development of a suitable flush runway lighting fixture.

Electrical power services were provided to seven terminal buildings, 54 other buildings, and three VOR installations. Work proceeded on 52 miscellaneous projects, including the design of electrical distribution systems and substation facilities. Purchase orders were placed for 52 diesel-electric generating units, and two static 'no-break' emergency power units were purchased for departmental evaluation.

Plans are now complete for the installation of centre line and touchdown zone lighting in runway 05 right at Toronto International airport. This lighting installation is an integral part of facilities required for Category II operations and it is the first of its kind to be installed in Canada. The estimated completion date is October 30, 1967.

Major Terminals—At Vancouver, construction of the new air terminal building continued in accordance with the program, and a contract was awarded for the utilities building.

At Montreal, the addition of the trans-border finger, another stairway in the international area, and vestibules to the international arrival lobby are to be completed shortly. Modifications to the international baggage conveyors and to the restaurant facilities have been completed.

The installation of moving sidewalks at Montreal was completed, the first facility of its kind at a Canadian airport.

At Toronto, revisions to the baggage room ventilation system, and layout and construction of two high-rise elevators are under way.

Roomettes at Edmonton were furnished, and refurbishing public areas at Windsor were completed.

A graphic sign system has been developed and studies were completed for Montreal, Toronto and Vancouver.

Studies for bridge loading and related facilities for Montreal, Toronto, Winnipeg and Edmonton were made, and extensive planning for Montreal and Toronto are under way.

Domestic Air Terminal Buildings—Projects at Sydney, N.S., and Katunayake, Ceylon, continued, and a contract was awarded for construction at Bagotville-Saguenay.

Work drawings and specifications were prepared for new terminal buildings at Val d'Or, P.Q., and Quesnel, B.C., for terminal extensions to the operation buildings at Fort Smith, Fort Nelson and Fort Simpson; and for an air traffic control building for the Jack Garland Airport at North Bay.

Design studies were made for proposed terminal buildings at Muskoka, Kenora, Prince George, Fort St. John, Terrace and Hay River, and for control towers for the airports at Sault Ste. Marie, Calgary and Pitt Meadows.

General and Special Buildings—Contracts completed or under construction included a rawinsonde station at Moosonee; sand storage buildings at Montreal, London, Timmins and Lakehead; an aeradio station at Burwash Landing; a maintenance garage and firehall at Fort St. John; a maintenance garage at Port Hardy; emergency power houses at Whitehorse and Prince George; a third contract at the Sydney Coast Guard College; and site preparations at the Mill Village satellite communications stations for the Canadian Overseas Telecommunication Corporation.

Working drawings, specifications and estimates were in progress for a marine operations building at Halifax; a telecommunications school and extensions to the radar building at Carp; phase four of the Canadian Coast Guard College at Sydney; Mill Village satellite communications station; St. Lawrence Ship Channel building at Cornwall; maintenance garage at Watson Lake; maintenance garage, firehall and sand storage building at Fort St. John; and the marine agency at Hay River.

Preliminary sketches and architectural design, research and estimates were made for a school for Air Services training at Ottawa; Rideau Canal headquarters building at Smiths Falls; Trent Canal headquarters building at Peterborough; and standards for Government living accommodation.

Operations—Approval was obtained to enter into negotiations with the municipalities of Saint John, N.B., and Calgary, Alta., for departmental take over of the airports in these two areas. Negotiations with the Department of National Defence commenced for the transfer of responsibility for the operation and maintenance of Goose Airport, Labrador, to this Department.

Discussions were held with officials of the Corporations of House Harbour, Magdalen Islands, P.Q., concerning the Department's take over of the airport.

Fire Losses—Fire losses for the year were reduced to an all-time low of \$8,020.44.

Maintenance—Studies relating to the modification of airport environment to increase aircraft safety were continued in association with the National Research Council Associate Committee for the Reduction of Bird Hazards to Aircraft.

Airport Capital Assistance Program—Contributions totalling \$1,168,387 were approved for local, remote and development airport construction and improvement—one each in Newfoundland, Nova Scotia, and Ontario; two each in New Brunswick, Saskatchewan, and Northern Alberta; and three in British Columbia. In addition, special assistance for two passenger operations buildings at Niagara District and Sarnia airports, at an estimated cost of \$72,635, was approved.

A total of 41 applications received are being processed. A start on some of them will be made during the next fiscal year.

Licences—At the end of the fiscal year, there were 721 airport licences in force, compared with 675 the previous year. Of these, 53 were new licences, and 668 were renewals. Thirty-four licences were cancelled, and there were 105 temporary heliport licences.

Air Traffic Control

Three air traffic control towers were commissioned during the year—at Stephenville, Nfld., Buttonville, Ont., and St. Andrews, Man.—and plans to commission an additional facility at Pitt Meadows, B.C., next year have been completed.

Aircraft movements recorded by the Department's 36 control towers totalled 3,316,669, compared with 2,688,239 the previous year, an increase of 23.4 per cent. Airline operations increased 9.7 per cent, and other civil operations increased by 27.6 per cent.

The eight area control centres handled 792,570 IFR (Instrument Flight Rules) flight plans, an increase of 6.4 per cent over last year.

The radar control capability of the air traffic control system has been increased by the provision of 64 code secondary surveillance radar (SSR) at 15 sites and expansion to a 4,096 code capability is planned. The ATC radar control will be further improved by the operational use of high-definition radars (ASR-5) which are now being delivered at Halifax, Montreal, Ottawa, Toronto, Calgary, and Vancouver. The initial ASR-5 was placed in operation at Winnipeg in 1966.

A contract was awarded for a digital computer and associated equipment for use in the Gander area control centre, to be delivered in 1967. This is the first of an extensive air traffic control automation program. Planning for the installation of data processing equipment at the Toronto area control centre is well advanced.

To meet the increasing requirement for air traffic control service, a greatly expanded controller training program has been implemented.

Airways and Air Routes

On March 31 there were 32,775 nautical miles of designated low altitude airways, 8,704 nautical miles of low altitude air routes, and 28,739 nautical miles of high altitude airways.

Airmen Licences

At the end of the fiscal year, there were 28,886 airmen licences in force, compared with 25,742 last year. These were classified as follows, with 1965-66 figures in brackets: Pilots—glider 926 (865); private 18,484 (16,546); commercial, 3,605 (2,942); senior commercial, 3,605 (2,942); airline transport, 1,817 (1,578); air navigator, 175 (136); air traffic control, 811 (804); flight engineer, 65 (61); aircraft maintenance engineer, 2,591 (2,437). In addition, there were 1,931 Class I and 318 Class II instrument ratings, compared with 1,569 and 162 respectively the previous year.

A study of the interchangeability of personnel licences with other countries received considerable emphasis during the past year.

The preparation of instrument standards, the publishing of a manual of instrument flight procedures, the combining of the pilot licence and the restricted radio operator's certificate, and a complete revision of the inspection instructions dealing with personnel licensing were completed.

The number of persons submitting applications to the Civil Aviation Medical Advisory Panel has been considerably greater than anticipated. A total of 85 cases have been referred to the Panel since its inception in February 1966.

Aircraft Licensing

Civil aircraft registered at the end of the fiscal year showed an increase of 780 or 10.2 per cent. Of the 8,454 registered, 2,349 were commercial, 5,905 were private, and 200 were State, compared with 2,167, 5,307 and 200 the previous year.

Further hovercraft trials were conducted in Canada and the first two Canadian registered hovercraft will be operating at *Expo* during the coming year.

Flying Training

From the 36 flying clubs and 91 flying schools, 3,915 private and 1,192 commercial pilots were graduated, compared with 3,053 and 647 graduates the previous year. Of the 938 flying instructors, 755 instructed in aeroplanes, 55 in helicopters, and 128 in gliders.

Examinations

Examinations of pilots, engineers, and other personnel totalled 14,949, compared with 11,901 during 1965-66.

Air Regulations Infractions

For infractions of air regulations, there were 67 prosecutions, 20 licences were suspended, and 155 letters of warnings were issued, compared with 48, 26, and 117 respectively for the previous year.

Air Carriers

On March 31, there were 714 commercial air carriers operating the various types of commercial air services in Canada, and holding one or more valid operating certificates. Of this number, 403 were Canadian air carriers and 311 foreign and Commonwealth.

Aircraft Accident Investigation

Engineering Laboratory—Engineering personnel and equipment now available give the laboratory considerable capability in the general aeronautical and metallurgical fields. Job input increased 26 per cent for 1966 with very little of this being referred to other laboratories.

Most of the work involves routine tests to ensure materials meet proper specifications. Fracture analysis, a time consuming and elusive factor in determining a sequence of events, proved helpful in determining the cause of one accident which occurred in the Arctic.

Underwater search for wreckage was again brought into prominence by the aerial disintegration of a C46 which is known to have plunged into a large lake in northern Quebec. After an unsuccessful attempt with new transit Sonar equipment, a Beechcraft fuselage was dropped into a 100-foot trench in the Ottawa River and trials conducted to prove the equipment would in fact locate such a relatively small target. These trials, which ended on December 1, just before freeze-up, were successful. Further development is planned using new miniaturized navigation equipment.

Statistical Highlights—During the year, accidents involving Canadian registered aircraft totalled 348. This increase of almost 30 per cent outpaced the increase in flying activity. To depict precisely the increase in activity is difficult, but the increases of 6.7 per cent in passengers carried, 7.9 per cent in departures and 12.7 per cent in aircraft miles, in schedule commercial operations are indicative of the nature and extent of the change.

The number of commercial aircraft registrations increased by three per cent, whereas the number of accidents involving this group of aircraft increased by about 24 per cent.

As illustrated in the graph, an increasing trend in accidents began in 1964 and continued through 1966. Projected forward, the trend indicates an expected 470 accidents to Canadian registered aircraft in 1967.

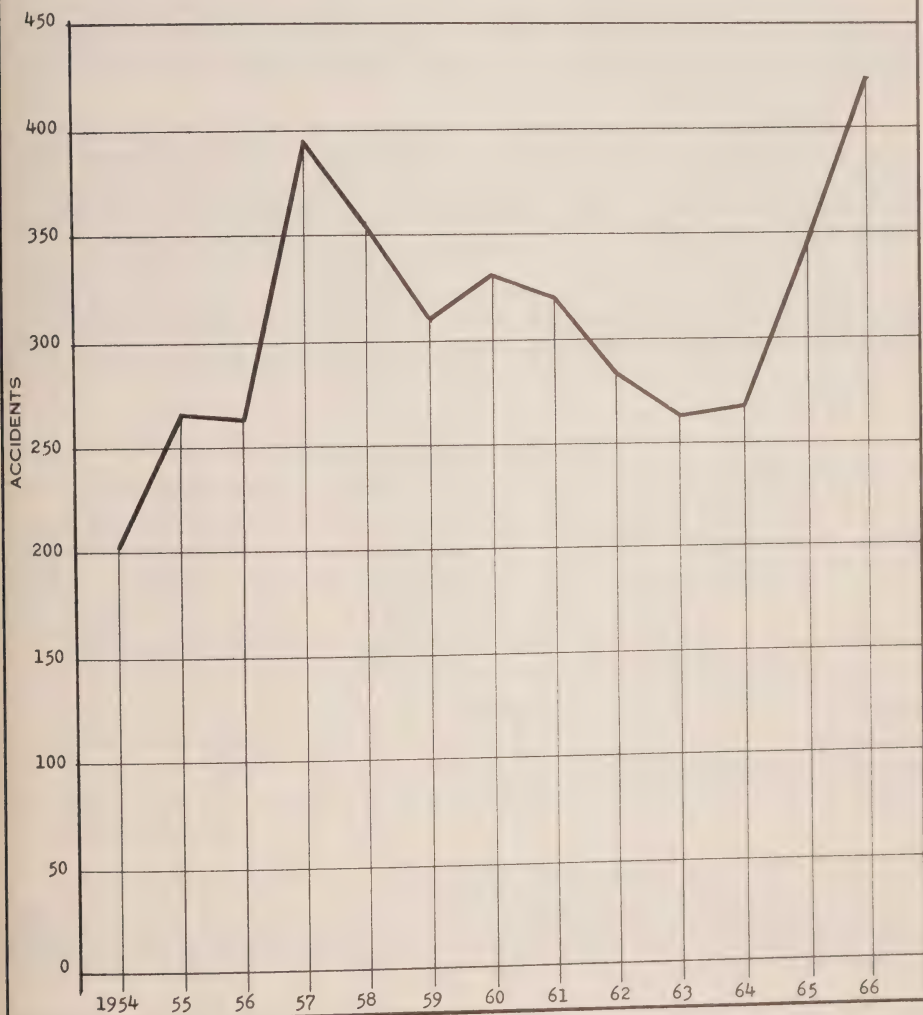
Flight Services

The Flight Services storage building, part of which is leased to the RCMP (Air Division), was completed and occupied in October of 1966.

The last of three Alouette helicopters from France was accepted, and the aircraft are now in operation at St. John's, Quebec, and Vancouver marine agencies.

A twin-engine S-61N helicopter was accepted and is operating at the Prince Rupert marine agency.

ACCIDENTS TO CANADIAN REGISTERED AIRCRAFT



Aeronautical Engineering

In July, the Canadian specification for flight data recorders was released. This is an electronic device which records such parameters as speed, height, aeroplane attitude and other flight data from which accident investigators can determine the flight path of the aircraft at the time of the accident.

By 1970 most of the other member states of ICAO will have passed legislation making the installation of flight data recorders compulsory in transport category air carrier aircraft. The Canadian specification has been recognized as a valuable contribution to the improvement of flight safety.

Aviation Fuel Management Methods—To determine whether any special measures are required to prevent the contaminants in aircraft fuel becoming a hazard to flight safety, an exploratory study of aviation fuel storage and dispensing methods was undertaken during the year.

The final phase of this study—the examination of fuel management methods at isolated airfields—has been started. In the North, aviation fuel is cached in drums and the normal precautions followed at main airfields are impracticable. Preliminary indications are that prescribed fuel handling procedures, if meticulously applied, are adequate to maintain the current levels of flight safety.

Airworthiness—Among the measures necessary for the control of airworthiness are the engineering investigation of aircraft designs and the approval of inspection organizations and companies. The following illustrates the scope of the work carried out during the year:

Aircraft Design Approvals Issued

	<i>Type Approvals</i>		<i>Supplemental Type Approvals</i>	
	Year ended		Year ended	
	March 31, 1967	March 31, 1966	March 31, 1967	March 31, 1966
Aeroplanes.....	6	4	12	16
Aero-engines.....	4	1	0	0
Helicopters.....	1	0	3	3
Gliders.....	4	2	0	0
Floats.....	4	2	0	0

One company and seven inspection organizations were approved during the year. Work continues on five aircraft and two engine approvals, and a number of supplemental approvals involving major changes.

Planning, Research and Development

During the year 24 new research studies were undertaken, including an examination of metro-to-airport transportation needs; a study of the aviation

"revolution" and its effect on Air Services planning; definition of the terminal gate requirements at the Winnipeg International Airport; a review of problems that may be associated with the sonic boom that will be produced by the commercial supersonic transport (SST); a report on the simulation techniques used by the British airport authorities; a study of air cargo in Canada; and a study of commercial pilot requirements.

Two operational and research officers are serving as members and scientific advisers to the Canadian delegation to the North Atlantic Systems Planning Group. A study completed during 1966 for this delegation examined the congestion of the aeromobile HF channels used for air reporting on the North Atlantic.

During the year, organizing and planning the introduction of aviation systems planning was undertaken. This involves the preparation of 20-year master plan reports for departmental airports, nine of which are in various stages of preparation.

Radio Regulations

Licensing—The number of radio station licences in force at the end of the fiscal year was 191,849 compared with 162,840 the previous year. These include stations operated by departments of federal, provincial and municipal governments (excluding the Department of National Defence), privately-owned point-to-point stations, stations on ships and aircraft registered in Canada, and mobile stations operating in the public and private land mobile services, but does not include private commercial broadcasting licences.

The number of general radio service licences in force totalled 50,859, an increase of 9,325 for the year.

Safety Radio Surveys, Inspections and Suppression of Interference—Radio Regulations inspectors, operating from 33 field offices throughout Canada, conducted 2,192 ship station radio surveys and 10,448 inspections of various classes to ensure compliance with Canadian laws and international conventions and treaties.

Interference complaints totalled 15,522 and 13,280 were completed, compared with 18,270 and 17,529 respectively the previous year.

There were four investigations of breaches of the Radio and Canada Shipping Acts and seven court actions.

A total of 10,076 infractions detected at monitoring stations were issued, of which 5,710 were domestic and 4,366 were foreign. Frequency measurements totalled 96,710.

Frequency and Call Sign Assignments—Frequencies assigned, amended or deleted totalled 19,315 and 3,762 were co-ordinated with foreign administrations; call signs amended or deleted totalled 8,560 and there were 104 cases of inter-station interference.

Examinations and Certificates of Proficiency in Radio—During the year, 7,166 examinations were conducted compared with 6,411 for the previous year, and 7,445 certificates were issued compared with 5,787 the previous year. As of March 31, the total number of certificates issued was 95,021.

Broadcasting

Applications processed for licences to establish amplitude and frequency modulated private commercial broadcasting stations (sound) and for changes of facilities in existing stations totalled 174.

A total of 169 applications for private commercial broadcasting stations (television) and for changes of facilities in existing stations were dealt with, and 340 for land stations performing a commercial broadcasting receiving service (CATV).

Applications for stations performing an auxiliary service to broadcasting totalled 229 and there were 227 applications for transfer of stock, change in ownership or change in name of licensee.

A total of 175 private commercial broadcasting stations (sound and television) either commenced operation or modified their facilities pursuant to the Minister's licence authority.

As a result of these applications, 74 notifications were distributed to signatory countries of the North American Regional Broadcasting Agreement. Notifications from signatory countries totalling 1,073 were scrutinized to ensure Canadian stations were being protected in accordance with the Agreement. Similar notifications concerning 36 television and 31 frequency modulated stations were forwarded to the Federal Communications Commission.

Radio Standards and Frequency Utilization Planning

The development of radio standards specifications and procedures governing the licensing of radio stations continued in close co-operation with the Canadian Radio Technical Planning Board. One such procedure was released and one specification in draft form covering general radio service equipment was sent to the Board. Eleven specifications are under development, eight of these being revisions of previous issues which now require up-dating.

The development of a VHF frequency selection procedure was completed. This procedure is a systematic method of making frequency selections in the 150 MHz band with special attention given to assessing and avoiding intermodulation interference. A computer program which will automatically perform most of the lengthy calculations involved in this procedure is in an advanced stage of development.

Manufacturers made a total of 280 requests for type-approval of radio equipment. Although most of the supporting tests are carried out in their plants, 43 units were tested in the Radio Regulations laboratory for which \$10,000 in fees was collected.

A program to modernize the equipment in the nine monitoring stations is under way.

In co-operation with the Canadian Radio Technical Planning Board, standard radio system plans for instructional television fixed service systems in the 2.5 GHz band and for radio-relay systems in the 4 and 6 GHz bands were issued. Guidelines covering the utilization of the 2 GHz, the upper 6 GHz and 7 GHz bands were also prepared to assist in planning microwave systems and in the future development of standard radio system plans for these bands.

Engineering briefs in support of applications for the establishment of new microwave systems or the expansion of existing systems totalled 150 compared with 116 last year. This increase has been primarily due to a large number of new systems in the 2 GHz band. Co-ordination of radio frequencies to be used at two communication satellite system earth stations, one in Canada and the other in the United States, was carried out to ensure that they would not interfere with Canadian radio-relay stations.

The mobile laboratory was employed for eight weeks on special field projects to determine the spectrum signals of radars used for navigation and surveillance. This information is necessary to ensure that radar systems do not cause interference to other Canadian microwave systems.

National Telecommunications Planning

Various questions pertaining to the establishment of domestic satellite communications in Canada were investigated. Policy studies in this field are being carried out by the Department in co-operation with other Government agencies. A consultant study on domestic satellite communications is also being made by the Northern Electric Company under contract with the Department. This study is very broad in scope, including a traffic prognosis, analysis of various system alternatives, economic trade-off studies between domestic satellite communications and terrestrial radio relays, an analysis of the use of satellite communications for all types of purposes (including service to remote regions of Canada), and interference studies. The objective is to provide technical, operational and economic background data which will be required as a basis for future policy decisions.

Through departmental co-ordination, an agreement has been concluded between the Bell Telephone Company, Canadian National Telecommunications and the United States Air Force for up-grading the military Polevault South system through technical improvements provided by the Bell/CNT to enable it to carry 11 civilian telephone circuits from the Island of Newfoundland to Goose Bay, Labrador. For the first time, direct telecommunications circuits for commercial use will be available entirely within the Province of Newfoundland. This service is expected to become available late in 1967.

The Mackenzie Valley communications system, negotiated by the Department with Canadian National Telecommunications, was formally opened for service on August 2, 1966. The system was extended by VHF radio to Tuktoyaktuk where long distance telephone service was thereby made available for the first time on December 22, 1966. Reindeer Depot was connected to Inuvik during the year.

To provide service enabling Department of National Health and Welfare remote nursing stations to keep in touch with hospitals and medical officers, the Department negotiated with Canadian National Telecommunications for the establishment of radio stations at Cambridge Bay, Inuvik, Spence Bay, Gjoa Haven, Bathurst Inlet, Pelley Bay, Thom Bay, Holman Island, Sachs Harbour, Snowdrift, Rocher River, Nehanni Butte, Fort Liard, Perry River, Old Crow, Pellett Lake, and Reindeer Depot.

Government Administrative Telecommunications

Implementation of the Treasury Board interim policy on General Services in Federal buildings by Civil Service Commission Management Development on a

pilot scale led to close interdepartmental co-operation in the integration of telecommunications at several locations, of which Rimouski was the first. Reports on the technical capability of alternative equipments and services and their relative costs were made to departments and to the Treasury Board, as well as programming information on new consolidated systems.

Joint studies on administrative telephone services were established with the Department of National Defence, of which the first result was successful integration of all Federal Government telephones at Victoria and Vancouver as a single system, to commence at the end of 1968, and to be large enough to have its own private lines to Ottawa. Data transmission applications of several departments were reviewed in studies closely co-ordinated with the Central Data Processing Service Bureau and the operating industry.

The common user inter-city telephone service savings were \$4 million in comparison with the cost of making equivalent calls at commercial rates. This was twice the savings noted in the previous year, and is largely accounted for by the volume of calls going up to 8,000 per average day by the end of 1966 from 4,000 per day the previous year. Administrative telephone circuits totalled 27,000 miles, compared with 13,000 the previous year and 2,700 the year before. This is in addition to 85 wide area telephone service lines at Ottawa, Montreal and Toronto, compared with 26 at Ottawa in the previous year and none before that. Apart from Quebec City, which will commence in July 1967, no other large consolidated telephone systems can be completed until 1968-69. In the meantime, smaller systems are being made up by combining switchboards to give more efficient Federal Government telephone service, as at Edmonton, with Hamilton, St. John's, Nfld. and others to come. At Winnipeg, wide area telephone service has been introduced on this basis.

Teletype sharing was evaluated at six pilot locations. As yet, there are no general conclusions, although some leased data services have been provided.

The Administrative Telecommunications Agency, in co-operation with the Department of National Defence, has been providing consultation to an engineering task force of the Trans-Canada Telephone System which is developing a 10-year program for plant expansion to meet all Federal Government requirements.

Radio Communications and Aids to Navigation

Marine Communications—Installations completed during the year included a new marine station at Comfort Cove, Nfld.; replacing the old station at Twillingate; and a new transmitter site at Bull Harbour, B.C.

Renovations, including installation of modern communications control equipment, were completed at Saint John, N.B., Montreal and Resolute Bay marine stations. At the Victoria marine station, renovation is in progress.

Fixed/Aeronautical Communications—Aeradio stations were established at Atikokan, Ont., Thompson, Man., Kamloops, B.C., and Burwash Landing, Y.T.; and radio and electronic apparatus was commissioned in a new control tower at Buttonville, Ont.

New transmitter sites were established at Quebec, Edmonton Industrial Airport, Kamloops, and Sachs Harbour, N.W.T.; and new receiver sites at Saint John, N.B., Kamloops, and Norman Wells, Y.T.

Automatic picture transmission system receiving stations were established at Halifax and Toronto to receive weather maps from Nimbus, Essa and ATS1 satellites.

Renovations, including installation of modern communications control equipment, were completed at the Moncton area control centre, airport control towers at Moncton, Saint John, Ottawa, Regina, Saskatchewan and Lethbridge, and aeradio stations at Moncton, Saint John, Ottawa, Regina, Saskatoon, Coral Harbour and Resolute, N.W.T.

Renovations in progress include Gander area control centre and control tower; Quebec control tower; and Victoria aeradio station.

Very High Frequency Omni-Range (VOR) and TACAN—VOR facilities were relocated and commissioned at Broadview, Sask. and Victoria, B.C., and four were placed on test—at Baie Comeau, Mont Joli, Sept Iles and North Bay.

Work progressed on the installation of a VOR at Trinidad under the External Air program and commissioning plans have been made for early 1967-68.

TACAN (Tactical Air Navigation) systems co-located with VOR facilities were commissioned at Gander, Sydney, Charlottetown, Moncton, Fredericton, St. Eustache and St. Jean, P.Q., London, Ottawa, Langruth (Man.), Broadview, Regina, Yorkton, and Empress, Alta. An additional facility was placed on test at Quebec City.

Instrument Landing Systems—The Instrument Landing System (ILS) at Prince George B.C., and the back beam marker/NDB serving runway 23L at Toronto were commissioned.

Construction of ILS at Yarmouth, St. Hubert, Grande Prairie and Port Hardy is nearing completion, in progress at Halifax and Churchill, and planned for Sudbury, Fort Nelson, Kootenay and Inuvik during the next fiscal year. Obsolete equipment is being replaced on runways 05L and 10 at Toronto.

Evaluation flight checks for ILS categorization to ICAO standards and analysis of results were completed for all ILS designated for categorized status. Facility improvement for categorization has been completed on one localizer at Toronto and is underway or in the planning stage for localizer equipment at Gander, Halifax and Montreal, and for glide path equipment at Calgary.

Low Frequency Aids—Marine radio beacons of various types were established at Spotted Island and Middle Island, Labrador; Cape Bonavista, Nfld.; Cape d'Or, N.S.; Miscou Island, N.B.; Great Duck Island and Battle Island, Ont.; and Egg Island and Lennard Island, B.C.

Dual purpose marine/aeronautical radio beacons were established at Channel Head, Nfld.; Heath Point, P.Q.; and Estevan Point, B.C.; and a low frequency radio range was established at Burwash, Y.T.

Aeronautical non-directional beacons were established at Natashquan, P.Q.; Atikokan and Pelee Island, Ont.; Regina; Footner Lake, Alta.; Dawson Creek and Vancouver, B.C.; and Watson Lake, Y.T.

Radar—Secondary surveillance radar equipment was installed at 18 sites across Canada and another one will be installed at North Bay when the new control tower building is completed.

Eight ASR-5 type radar systems were procured for terminal area control of air traffic and installation was completed at Winnipeg early in 1966. Installations will be completed in 1967 at Montreal, the Carp Air Services school, Toronto and Vancouver, and at Halifax, Ottawa and Calgary in 1968.

Additional radar bright display equipment (converts from radar PP1 type display to television type display) was procured for the nine major airports across Canada and for the Carp school. All installations will be completed during 1967.

A C-band weather radar was installed at the meteorological research site at Toronto.

Avionics—Standardization of the avionic systems in the Department's three Viscount aircraft was completed. Development engineering was begun on the Viscount flight inspection aircraft to evaluate new avionic systems and equipment and to develop new flight inspection techniques.

As part of Canada's foreign aid to the government of Trinidad and Tobago, engineering development and equipment procurement was carried out for an airborne VOR/ILS flight inspection system. The system has been planned for installation in a Trinidad aircraft by Trinidad personnel.

Departmental personnel carried out the installation of avionic systems in two Alouette III helicopters and supervised the contract installations in two Kingair, one Baron, and one JetStar aircraft and one S61N helicopter.

Modernizing and standardizing avionic systems in the five departmental DHC Beaver aircraft was begun and three installations were completed.

Ship Electronics—Marine communications and navigational electronic equipment was provided for new and commissioned vessels. More than 30 large equipments and numerous small items were procured to improve facilities on commissioned vessels. Installation has been completed for most items and is under way for the remainder. Equipment was procured for 14 vessels under construction; planning and installation was carried out in conjunction with the vessel construction schedule.

Maintenance and Operations

In the ionospheric service, five stations operated throughout the year and continued to provide direct support for the Alouette I satellite. Resolute, N.W.T., continued command and telemetry recording of Alouette I and II, and Churchill support to the rocket research program.

Scientific interest in ionospheric data has expanded during the year, the National Research Council and the Defence Research Board having increased their use of this data. The year's work has been consolidated by the use of machine data processing methods and the preparation for new advances in automatic techniques.

As a result of a continuing review of operational requirements for existing navigational aids and aeronautical services by the joint committee representing the Telecommunications, Meteorological, and Civil Aviation Branches, ten low frequency ranges were replaced by radiobeacons.

The co-ordinated plan for the operation of the marine radiobeacon systems of Canada and the United States is nearing completion, a few radio beacons remaining to be added to the Canadian system.

Two East Coast stations began copying radio signals from the Nomad buoy, an ocean-based automatic weather station anchored off Nova Scotia. Meteorological data is transmitted in Morse every six hours and provides information on temperature, pressure, wind direction and force.

Maintenance responsibilities were assumed for 30 Air Canada ground-to-air installations, for telemetry systems associated with the wind-wave study project on Lake Superior and the Gulf, for six newly commissioned vessels of the Canadian Coast Guard, and for the Nomad buoy.

An equipment availability and component failure reporting project was implemented in 1966 on a national basis. This project is a technique for reporting facility outages and component failures. An IBM computer located at Ottawa can be programmed to provide statistical printouts by components, equipment types, or systems. A national availability report was developed and will be issued on a monthly basis. The report will provide the users of services with accurate figures showing the reliability of major electronic systems maintained by the Department.

Research and Development

Space Systems—The experimental earth station at Mill Village, N.S., completed all pre-operational tests. The facility has been turned over on a temporary basis to the Canadian Overseas Telecommunication Corporation to carry commercial trans-Atlantic traffic until completion of their own facility in 1968. The station handles telephone and television circuits via the Early Bird satellite on a time-sharing arrangement with the U.S. station at Andover, Maine.

Computing Systems—The Gander Automatic Air Traffic System (GAATS) is scheduled for operation in July 1967. Developed in co-ordination with the Civil Aviation Branch, the system will aid air traffic controllers by performing certain routine tasks automatically, and will provide improved use of oceanic air space through the ability of the computer to perform extensive calculations on the flight paths of aircraft with considerably greater precision than can be done manually in the time available in the present system.

Backup equipment for the present azimuth and elevation display equipment is being built for the Mill Village satellite antenna. This equipment will not only improve the reliability of the display system, but will also free the computer for other data processing tasks. Installation is scheduled for July 1967.

Film digitizing equipment, called the precipitation data integrator, has been designed and is under construction for the Climatology Division of the Meteorological Branch, to process weather radar information from photographic film automatically. The equipment, which will be used for hydrometeorology research, is one-third complete.

A computer program called the ionospheric data reduction program was written. This program enables computer calculation of statistics describing the state of the ionosphere from data gathered at various ionospheric sounding stations in Canada. The results are used for predictions for radio transmission. This technique replaces certain manual methods previously used.

A computer program for the automatic processing of field measurements of Instrument Landing Systems at airports was written. The program enables computer analysis and automatic plotting of various parameters of the glide path and

localizer of ILS at airports in Canada. The computer process replaces manual methods previously used.

Navigation Aids, Radar and Video Systems—Study and evaluation of the shelters, power supplies and telemetering systems for unattended facilities in isolated areas continued.

An Omega navigation system was studied in preparation for evaluation of its usefulness in the Canadian Arctic. Preparations were completed to install requisite equipment on board CCGS *Labrador* for summer 1967 testing.

Two proposals for an SSR primary radar digital transmission system to meet Canadian requirements of radar remotoring for air traffic control purposes have been received and studied and arrangements made to procure a prototype radar remotoring system.

Laboratory testing of a 250-mile looped telephone line is in progress to determine the necessary parameters for reliable digital data transmission. Equipment for this study project was procured and experiments commenced to assemble statistical data.

Theoretical studies for investigating the possibility of obtaining ice thickness data by remote means were continued. Several possible methods are indicated, e.g., microwave and infrared, which will have to be compared to select the most practical and economical.

St. Lawrence River Traffic Control

Methods for aiding the control of St. Lawrence River traffic have been investigated. The first phase of this project which involved the provision of complete VHF coverage of the river between Montreal and Les Escoumains will go into operation on April 3, 1967. Study is continuing on possible additions to the overall system to provide for automatic position reporting and river situation display.

Landline Services

Air Traffic Control—The Air Traffic Control National Interphone Network was expanded with the provision of "hot line" circuits between Windsor-Detroit, Toronto-Montreal, Toronto-Ottawa, Montreal-St. Hubert, and Ottawa-Carp; and an existing facility, Toronto-Downsview, was converted to a "hot line" circuit.

Push button control panels and associated electronic equipment for the termination of interphone circuits at area control centres, terminal control units, control towers, and air traffic control training schools were installed at Moncton, Saint John, Cartierville, Montreal, Ottawa, Toronto Island, Toronto, North Bay, Winnipeg, Saskatoon, Edmonton, and Whitehorse. A prototype panel was also provided for the air traffic control display at Expo 67.

Two-digit selective signalling was provided on air traffic control interphone circuits Moncton-Bagotville, Sept Iles-Goose Bay, Montreal-Bagotville, and Vancouver-Anchorage.

Arrangements were made to lease dataphone/dataspeed facilities between Washington and Ottawa in conjunction with the Gander Automatic Air Traffic System (GAATS) tests to be carried out at the Research and Development Laboratory, Ottawa.

Investigation continued and progress made in studying the availability of leased electronic equipment suitable for the analysis of various loading criteria on national network and local circuits terminated at the area control centres.

Air and Marine Operations—The airops national teleprinter network was extended to Thompson, Peace River, Fort Good Hope, Inuvik, and Burwash Landing, and express circuits between Toronto-Montreal, Vancouver-Edmonton were converted to full duplex operation. A new circuit was established between Gander-Moncton.

Three of the four Icecan/Scotice cable circuits between Gander-United Kingdom were upgraded to 100-word-per-minute operation.

Meteorological Services—The weather facsimile national network was extended to Argentia, Camp Borden, and the University of Alberta, and a number of stations were transferred from the Edmonton Regional network to the Winnipeg Regional network.

The weather teleprinter national network was extended to Comfort Cove, Port aux Basques, Charlo, Kitchener, Detroit and Sault Ste. Marie, U.S.A., Camp Borden, Atikokan, Thompson, La Ronge, University of Alberta, Fort Simpson, Wrigley, Norman Wells, Fort Good Hope, Inuvik, and Burwash Landing.

Temporary facsimile or teleprinter facilities were provided in support of Canadian Forces Day at Shearwater, Summerside, and Wainwright; Fisheries Exhibition at Lunenburg; ice reconnaissance at Frobisher Bay, Goose Bay, Gander, Halifax, Sydney, and Mont Joli; Career Week at Ottawa; Research Council at Penhold; United Nations Week at Edmonton; hail studies and hail suppression at Calgary and Edmonton; and forest fire protection at Vancouver.

By request, proposals have been submitted from common carriers for the conversion of the existing leased national weather teleprinter networks from manual switching to an electronic, digital, non-dedicated, computerized mode of switching operation. These have been reviewed and planning is well under way to implement the conversion at an early date.

Marine Traffic Control—Push button control panels and associated electronic equipment, local and long line interphone circuits, telex, telewriters, and remote control landline circuits for various VHF radio installations were provided in support of the Marine Traffic Control Centre established in Quebec City for control of shipping in the lower St. Lawrence River and the new Pilotage Information/Dispatch Centre at Montreal.

International Conferences

As a member of the Administrative Council of the International Telecommunication Union (ITU), Canada participated in the twenty-first session held in Geneva from May 9 to June 3, 1966. The Department was also represented at other ITU Conferences, including the Extraordinary Administrative Radio Conference in Geneva, March 14 to April 29, 1966; the XI Plenary Assembly of the International Radio Consultative Committee (CCIR) in Oslo, Norway, June 1966; the Study Groups and Working Parties of the International Telegraph and Telephone Committee (CCITT) held at various locations throughout the world in preparation for the IVth Assembly scheduled for 1968 in Buenos Aires.

Representatives attended meetings of the Inter-Governmental Maritime Consultative Organization (IMCO) held in London; the NATO Civil Communications Planning Committee in Paris and the Allied Radio Frequency Agency in London; the Fourth Carribean Regional Air Navigation meeting of ICAO, Mexico City; the ICAO Communication/Operations Divisional meeting, Montreal. Representation was also provided on the Joint Working Group on the use of satellites for air/ground/air communications and position determination of aircraft, Washington; on the All Weather Operations Panel on calibration and flight testing of ground ILS, Frankfurt; and the technical sub-committee of the International Telecommunications Satellite Consortium which met every two months in Washington.

Meteorological

Forecast Services—Forecast services were reorganized in Alberta by the conversion of existing facilities at Edmonton into a weather office providing forecasts for the province of Alberta and a weather central providing forecasts and other guidance material for the Arctic. New weather offices were opened at Kitchener-Waterloo and Penticton.

The boundaries of the marine weather forecast areas for northeastern Canadian waters were revised to permit more detailed description of expected weather conditions and to match more closely the prevailing weather patterns in these areas. A similar revision of marine forecast area boundaries for waters bordering the Maritime Provinces and Newfoundland is under way and will be introduced in early summer 1967. The number of marine forecasts will be increased from three to four per day.

On the West Coast a special marine bulletin was introduced for broadcast by local radio stations. The bulletin included observed and predicted weather conditions for a number of coastal locations and was well-received by small boat operators in the area.

In Montreal and Toronto special city weather teletype circuits were installed connecting the local weather office with metropolitan newspaper offices and radio and television stations. The circuits carry current hourly weather information, weather advisories and warnings and the latest weather forecasts. Plans were made for the establishment of similar circuits in other Canadian cities when a requirement for the service is established and funds are available.

New supporting weather services for the expanding hydrological operations along the Columbia and Saskatchewan rivers were planned and developed. Similar special supporting weather services were designed to meet the needs of forestry, particularly in Alberta and British Columbia where new forestry techniques and practices made the influence of weather conditions of critical importance.

Increasing use was made of the expanded output from the Central Analysis Office, Montreal, of computer-produced data in the preparation of weather charts and advisories at forecast offices across Canada. Treasury Board approved the lease of an IBM 360 model 65 H system and installation is planned for mid-1967. The new system will be approximately twelve times faster than the present one.

Communications—The meteorological teletype system, with 59,000 miles of circuit, served 390 stations with 663 connections. The weatherfax system operated to 95 stations equipped with 117 connections over 15,900 miles of facsimile network. Supplementary teletype circuits connecting Edmonton, Winnipeg, Toronto and Montreal were installed to improve the distribution of traffic and relieve congested circuits.

Ice Observing and Reconnaissance—Since 1957, ice observing has been a Meteorological Branch responsibility. On the occasion of the tenth anniversary, a significant advance was made in the tools for ice observing. A charter was negotiated with an air carrier to provide two DC-4 aircraft, specially modified, for a period of five years. The reduction in the number of refuelling stops and the greater speed of DC-4 aircraft provide a decrease in the time lapse before the ice information is available to the user. An overall precision navigation system provides a high degree of position accuracy, essential in the charting of ice conditions. To ensure precise location, the aircraft is equipped with Doppler radar, precision gyro compass, navigation computer and ancillary equipment. Much of the navigation equipment is duplicated to ensure reliability. To supplement visual observation, the aircraft is equipped with radar and closed circuit television.

Upper Air Observations—The upper air observing network was increased to 33 stations when the operation of Stephenville was taken over from the United States Air Force in December 1966. A new GMD-2 radiotheodolite was installed and arrangements made to supply the station with helium gas in cylinders until a proper hydrogen generating building could be constructed.

At Moosonee, the new upper air station was completed and operations were transferred to the new site in December. The old site will continue to be occupied as a housing area by the meteorological staff. Considerable preparatory work was undertaken to consolidate all the operations at Inoucdjouac (Port Harrison), P.Q., into one settlement on one side of the river. A somewhat similar project was initiated at Clyde River, with surveys being carried out to determine the costs and feasibility of consolidating various government activities into one settlement across the river from the present site.

The installation of the new electrolytic hydrogen generators was delayed pending the completion of a study by the Canadian Standards Association to determine whether the necessary safety standards have been met. These studies resulted in some minor modifications to meet CSA standards and installations are expected to commence early in 1967. The introduction of the new generators will eliminate most of the inconvenience and hazards associated with the current methods of generating hydrogen gas by the use of chemical reactions.

The major part of a continuing program to reinstrument radiosonde stations with modern equipment was completed. Further procurement is now under way to complete the program, which will provide all stations with a capability of measuring winds and other meteorological parameters to at least 100,000 feet.

Pacific Weatherships—The new Pacific weathership, CCGS *Vancouver*, was completed and turned over to the Marine Branch in July 1966. Following a series of operational trials, the ship undertook a shakedown cruise lasting from November 24 to December 20. Several minor breakdowns and a considerable number of defects were uncovered during the cruise as the ship was subjected to all the

various manœuvres and activities which would be encountered on a regular weather patrol on station "P". A complex weather radar was installed to measure winds to 100,000 feet and to locate rainfall within 150 miles of the ship. The balloon tracking and weather radar did not meet operational requirements and a considerable amount of additional work was required to make it function in accordance with operational standards.

The second weathership, CCGS *Quadra*, was turned over to the Department in March 1967. So that maximum use can be made of facilities on the two new weatherships, the observational program is being increased to four complete upper air observations per day and the surface observing program will include weather radar observations as well as a full program of hourly observations. This in effect will constitute an increase of approximately 50 per cent in the weather observing program carried out by the former weatherships, *St. Catharines* and *Stonetown*.

NOMAD Buoy—On September 20, 1966, the Meteorological Branch began operating a telemetering weather buoy, known as *NOMAD*, at latitude $43^{\circ}10' N.$, longitude $62^{\circ}30' W.$, in about 50 fathoms of water off the southeast coast of Nova Scotia. The equipment is on two-year loan from the United States Navy. The buoy consists of a boat-shaped aluminum hull $20' \times 10' \times 7'$, containing the telemetering system, radio transmitter, and storage batteries. Above the flat deck, about 18 inches above the water line, are two masts at the stern which support the meteorological sensors and radio antenna, and a third structure at the bow which carries a high-intensity light and two windmills driving a battery charger. The sensors measure barometric pressure, air temperature, sea temperature, wind direction, and wind speed. The buoy is programmed to register these readings automatically (normally at 3-hour intervals), convert them to Morse code letter groups, and transmit them on 5340 K Hz at 5 Kw peak power. If wind speeds higher than 30 knots are being registered, a special unit of the wind sensor automatically changes the transmission schedule to an hourly mode. A number of departmental radio stations in Nova Scotia and Newfoundland receive the signals and send them by landline to the Sydney weather office for encoding in meteorological format and transmission on the weather teletype circuits in Eastern Canada. About mid-June 1967 the buoy will be overhauled and the battery re-charged and moored on the same station where it will remain in operation until about July 1968. A thorough evaluation of the operational capabilities and the serviceability of the buoy will be submitted after completion of the trial operation.

Runway Visual Range Instrumentation—An extensive program was initiated to equip Canadian civil and military airports with transmissometers to measure visibility along ILS runways. These instruments are equipped with computers which derive the runway visual range during periods of restricted visibility and display the value digitally in the control tower and other flight control facilities where it will be available for transmittal to aircraft. Canadian manufacture of the equipment was arranged. The initial phase of this project will take three years to complete and will involve 50 installations.

Automatic Weather Stations—Several types of automatic weather stations are under development. A station capable of measuring eight meteorological parameters and transmitting the values on demand via teletype to a central point was constructed and tested. One such station will operate at Expo 67 and action

is under way to procure a further quantity of these stations from a Canadian manufacturer for use in a meso-meteorological network and subsequently at a number of reporting points in the weather observing network.

A prototype radio reporting automatic station capable of sensing and transmitting air temperature, snow and rainfall was developed and is under test at Mt. Enderby, B.C. This station is designed to provide information on runoff in watersheds such as the Columbia Basin.

Weather Radar—A display and data handling system for use on land-based weather surveillance radars has been developed by a Canadian company and is being evaluated.

Wind Wave Instrumentation—In connection with an investigation of the windwave characteristics of the Great Lakes shipping channels, instrumentation was developed which is operated on a specially designed stabilized buoy platform on which a 64-foot mast is mounted. The wind speed, air and sea temperatures are measured at several levels above the water, as well as the dynamic characteristics of the waves, and the data are transmitted by radio to a shore station where it is recorded. The performance of a pilot installation was evaluated in the late summer of 1966.

Climatological Networks and Stations—An increase of 67 stations was reported to the climatological station network. On March 31, 1967, the total number of stations was 2,399, which included 244 synoptic or principal climatological observing stations; 1,446 climatological stations; and 549 precipitation only climatological stations. Temperature extremes are now recorded at 1,711 stations; daily precipitation amounts at 2,259; rainfall intensity at 312; hourly wind mileages at 222; and hourly bright sunshine at 210 stations.

Climatological Research—A co-operative study of the microclimate of forest stands in clearings was continued with the Canadian Department of Forestry and Rural Development. Instrumentation and procedures were developed to test mathematical models which may be used to evaluate energy growth relationships. This forest productivity study is part of the Canadian contribution to the International Biological Program. Another co-operative field study to investigate the microclimatic conditions relating to fruit production in southwestern Ontario was continued with the Ontario Research Foundation. Mobile equipment was used to define which areas are least affected by frost.

Hydrometeorological Research—By the end of the fiscal year, 40 International Hydrologic Decade (IHD) projects had been undertaken. In 10 of these, responsibility for planning and carrying out research work was assumed, and in 30 additional projects the Branch plays a supporting role providing meteorological instrumentation, advice and assistance to projects sponsored by universities, provincial and federal agencies. A leading role is being played in studies of the energy budget and prediction of ice on the Upper Niagara River; various methods of estimating evaporation of small lakes; effect of elevation, aspect and exposure on hydroclimatic factors in British Columbia; the use of airborne infrared radiation thermometer for surveying water temperatures in northern lakes; and the use of weather satellite data for Canadian hydrologic purposes. The Branch took a leading role in planning for the International Field Year on the Great

Lakes an integrated program of physical research proposed for 1970 and sponsored by the United States and Canadian National Committees for the IHD. In addition, investigation of Great Lakes levels, basin precipitation, evaporation, lake temperatures and winds over the lakes was intensified. Studies of critical weather conditions for maximum floods for dam design purposes are under way for several Quebec south shore river basins in collaboration with the Quebec Department of Natural Resources and for the Hamilton River-Churchill Falls development in Labrador. Supporting analyses were made for the selection of northern airport and communications sites and for the exploration of oil in Hudson Bay and Labrador.

Micrometeorological Research—Three additional cities joined the National Air Pollution Network, bringing the number of agencies submitting data to 15. A review of data acquisition and processing techniques was undertaken.

Projects undertaken in co-operation with the Occupational Health Division, Department of National Health and Welfare included an analysis of smoke samples observations from Canadian cities to serve as guide for the establishment of ambient air quality standards; a study of aerodynamic downwash at the Environmental Health Centre, Ottawa; and an evaluation of the meteorological aspects of the diffusion of hydrogen sulphide from a heavy water plant.

Instrumentation of the CBC television tower in downtown Toronto was completed, with wind and temperature sensors installed at the 200, 300 and 400 foot levels. Reports relating to air pollution data to meteorological factors at Sydney, N.S., and Regina and Saskatoon, Sask., were written.

A major field project, undertaken at the request of the Department of Energy, Mines and Resources, was conducted at Mt. Kobau, a 6,200-foot peak near Osoyoos, B.C., which is to be the site of the Queen Elizabeth II Observatory and 150-inch telescope. Results of investigation that have been and will be made over the next three years will determine the best height and position for the telescope and the prediction of conditions under which good seeing may be expected.

A 30-foot tower with two levels of instrumentation for wind, temperature, and humidity was erected at the Meteorological Research Station, Toronto, in June. Preliminary energy balance studies have been so satisfactory that plans were made to expand to three towers with six levels on each.

In the wind-wave study for the Marine Regulations Branch, an operating system was developed for the translation of raw data tapes, and computer processing of the translations has been thoroughly investigated. Attempts to acquire over-water weather observations from stable platforms on Superior Shoals and off the west point of Anticosti Island have been unsuccessful because of equipment trouble.

Physical Research—At Resolute, the ozonesonde pilot project produced 72 soundings of the stratosphere. Plans for the development of a high altitude atmosphere research observatory at Mt. Kobau were approved. The National Atmospheric Radiation Centre participated in an extensive program of improvement in calibration methods and facilities. Radiation instrumentation for the new Pacific weather ships was completed, and installed and tested aboard CCGS *Vancouver*.

Studies into the basic causes of cloud and precipitation formation were continued. A scientific report on the cloud seeding conducted between 1960 and 1963 in the Rouyn-Noranda area of Quebec was published and indicated that no

significant effect on the measured rainfall had been detected. Smaller scale studies of precipitation mechanisms are continuing in association with the trailerized 5-cm weather radar located at the Toronto meteorological research station. A weather radar analyzer and data processor is being integrated into the system and will provide synthesized weather radar data for use in forecast studies, hydro-meteorological analyses and general radar meteorology studies.

A preliminary study of lightning detection methods under contract with the University of Western Ontario was completed. Plans are under way for the measurement of atmospheric electricity variables at the meteorological research station, and for integration of these studies with further contract studies into the methods of detecting and tracking lightning. These studies are of vital importance to the economy in combating the damage caused by lightning storms.

Studies into the basic causes of hail and how to prevent it were continued in Alberta in co-operation with the National Research Council, the Research Council of Alberta and the Stormy Weather Group of McGill University. A variety of surface and upper air observation techniques were used, including radar.

Dynamic Research—Evaluation of a multi-level prediction model which takes into account the formation of rain and snow in areas of large-scale ascending motion was completed. This scheme predicts precipitation amounts, together with flow patterns at five levels ranging from sea level to 30,000 feet. An important feature of the model is that it takes into account the effects of latent heat released in the formation of cloud precipitation. Precipitation patterns and amounts were predicted with considerable success, but heavy convection or showery rainfall tended to be underestimated.

Development work has also continued on the design and testing of prediction schemes with fewer levels in the vertical but always including the surface level. Some calculations have been made of the vertical structure, speed of motion, growth rate and stability of simple wave patterns in a westerly flow which increases with height.

A number of continuing studies on the stratosphere and upper atmosphere were carried out, including a study of high-level data to improve understanding of rapid warmings in the stratosphere and examination of ozone data to study stratospheric circulations. Noctilucent clouds (at heights above 200,000 feet) were observed to give information on the physical and dynamical processes in the upper atmosphere.

Synoptic Research—A computer analysis system was developed for the study of local hourly and other data recorded on punched cards. A second run of this system was completed for a series of studies concerning intercomparisons between reports from stations in the Toronto area. Included in the studies were: differences in maximum temperature between Malton Airport and downtown Toronto; local variations in ceiling and visibility in respect to precipitation, time of day, season, and wind direction; local variations in thunderstorms; a complete study of Toronto area lake breeze occurrences and influences; and relationship between winds and pressure systems.

An analysis was carried out of ten years of tower wind data consisting of winds measured simultaneously at two levels—20 feet and 200 feet. This will provide an important indication of the low level wind-change risks that must be considered in the operation of aircraft landing systems.

Toronto area snowfall was studied to develop techniques for forecasting the distribution of snowfall over a metropolitan area. The basic patterns recognized by the statistical analysis used were translated into a preliminary forecast procedure. Plans for further statistical analysis of this large data-set were developed and work begun on programming.

Around Toronto International Airport, a mesometeorological network has been established to improve airport terminal forecasts and for application to air pollution and agriculture. The data from this network are being used to study the mesoscale circulation relative to the terrain of the area and to the synoptic scale circulations. Plans are well advanced for the installation of several automatic weather stations in the network and a mobile facility to provide measurements of ceiling and visibilities. Using techniques indicated above and other concepts, a methodology is being developed for automated short-range airport terminal forecasts.

A satellite data laboratory was set up to study the use of weather satellites for meteorology as well as other purposes. It is receiving automatic picture transmission data from four meteorological satellites and is evaluating them for use in forecasting, ice reconnaissance and other activities. Studies to provide a photo-interpretation key for forecasters, to develop procedures for using satellite data in forecast routines, and to recommend on the establishment of operational stations are nearing completion.

Investigation into long-period atmospheric oscillations, particularly the so-called biennial cycle, continued, centering around the improvement in analysis techniques, and the collection of more time series of various weather parameters.

Grants in Aid of Research—Grants to Canadian universities in aid of meteorological research totalled \$125,000. Of 31 applications for 1967-68 from 15 universities, the Advisory Committee recommended 18 for grants totalling \$141,300.

Training—During the fiscal year, 29 general science university graduates graduated as professional meteorologists from courses given at Meteorological headquarters. Honours university graduates taking M.Sc. studies totalled 24. Student assistants and University of Waterloo co-operative program students on courses at Meteorological headquarters totalled 35. Students taking meteorological courses at the Air Services Training School, Ottawa, and the training school at Streator, Ill., numbered 650. A workshop at Edmonton and a cross-country lecture tour were organized.

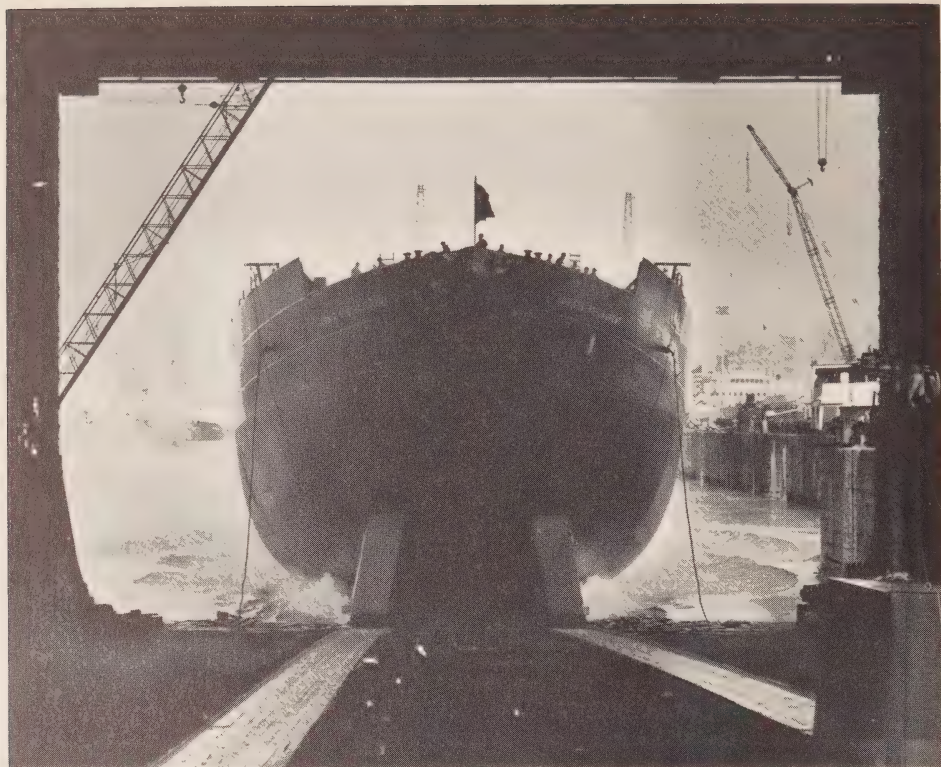
Film—The first film on the work of the Meteorological Branch, entitled *In One Day*, produced by the National Film Board in 35 mm colour for theatrical and general distribution, was planned for release on July 1, 1967.

World Meteorological Organization—Participation in WMO meetings included those concerned with the International Hydrological Decade, tropical meteorology, automatic weather stations, and the World Weather Watch. Professional staff served on all eight technical commissions and on 24 working groups and panels. Two staff members continued to serve as presidents of technical commissions and another was elected president of WMO Regional Association IV, thus becoming a member of the WMO Executive Committee.

Technical Assistance—Three staff members were made available for WMO Technical assistance missions—an expert on meteorological communications to assist the Government of Pakistan, a meteorological telecommunications expert to assist the Government of Iran, and a meteorological instructor to help the Government of Libya. Two staff members were granted leave of absence to accept technical assistance positions in the WMO Secretariat in Geneva. Several students, with financial assistance from WMO, UN or the External Aid Office, received professional training at Canadian universities and in the Meteorological Branch. Included were students from Guyana, Malaysia, Hungary, Poland, Syria, Ceylon and India. One expert from Iceland on a one month UN Fellowship for studies pertaining to ice hydrology and engineering received specialized training for a short period.

Meteorological Services to the Department of National Defence

Services provided to the Department of National Defence included operation of a basic network of surface and upper air weather observing stations, a weather communications network and a forecasting service including centralized weather analysis facilities, climatological and instrument services and the limited use of branch training facilities, the operation of weather facilities in HMC ships and at most of the Canadian Forces bases in Canada and abroad. Some 155 meteorologists and meteorological officers were serving with the DND at the end of the year either on secondment or with short-service commissions.



CCGS *Louis S. St-Laurent* launched at Canadian Vickers Limited, Montreal, December 6, 1966.

MARINE SERVICES

Aids to Navigation

Manned stations where major aids such as lights, sound signals and radio beacons, unmanned stations where continuous attendance at lights or sound signals is not required, and floating or buoy aids are maintained.

During the year, various programs were initiated to improve the overall system, and close liaison is maintained with shipping interests, associations, pilotage organizations and other groups concerned.

The plan to convert all battery-operated low voltage aids to 12 volts over the next five years will improve the light appearance and will facilitate equipment procurement. The program includes the introduction of standard flash characteristics across the country.

A program of grouping minor aids, whether buoys or shore lights, and calling tenders for their maintenance and operation commenced in 1967. This plan will reduce the number of outside service people to deal with and will develop a more efficient operation.

During the year hovercraft demonstrations were observed to assess the possibility of their use in servicing aids.

Tabular Report of Aids to Navigation

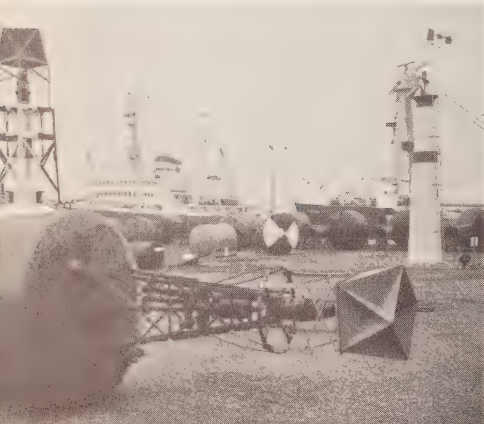
Statement, by Districts, showing the number of Lights and Fog Signals for the Fiscal Year ended March 31, 1967.

District	Oil Vapour Lights	Oil Wick Lights	Commercial Electric Lights	Station Generated Electric Lights	Battery Electric Lights	Acetylene Lights	Total Lights	Diaphones	Tyrons	Whistles	Electronic Signals	Mechanical Bells and Gongs	Hand Fog Horns and Bells	Total Fog Signals
St. John's, Nfld.....	9	31	48	26	167	115	396	57	2	6			6	65
Charlottetown, PEI.....	11	7	127	1	211	7	364	9	2					17
Dartmouth, N.S.....	3	10	127	21	77	3	241	25	13	1	6		6	51
Saint John, N.B.....			139	20	36	2	197	22	5	22		3		52
Quebec, P.Q.....	9	38	185	16	141	20	409	35	3	16	1		14	69
Sorel, P.Q.....			77		147		224							
Parry Sound, Ont. and Sub-Agencies			197	23	332	14	566	25	4	9	3	1	9	51
Prescott, Ont.....			134	5	212	1	352	13	7	6	4	3	2	35
Victoria, B.C.....			67	25	403	4	499	28	12	7	6	5	31	89
Prince Rupert, B.C.....			2	14	215		231	9	4		1			14
Hay River, N.W.T.....			2		137		139							
Totals.....	32	86	1,105	151	2,078	166	3,618	223	52	67	21	12	68	443



Department's new twin-turbine Sikorsky helicopter based at Prince Rupert Marine agency, B.C.

Canadian Coast Guard helicopter delivering mail and supplies to Race Rocks, B.C., lighthouse keeper.



Coast Guard Day, Dartmouth, N.S., June 18, 1966.

Maugher Beach lighthouse at the entrance to Halifax Harbour, N.S.



A cabin cruiser enters Burritt's Rapids Lock on the Rideau Canal.



Vancouver International Air Terminal under construction.



Long Island Lock on the Rideau Canal.



New control house at the Newboro Lock, Rideau Canal.

Moving sidewalk at Montreal International Airport went into operation August 3, 1966.



Part of the D.O.T. fleet of aircraft for Air and Marine Services.



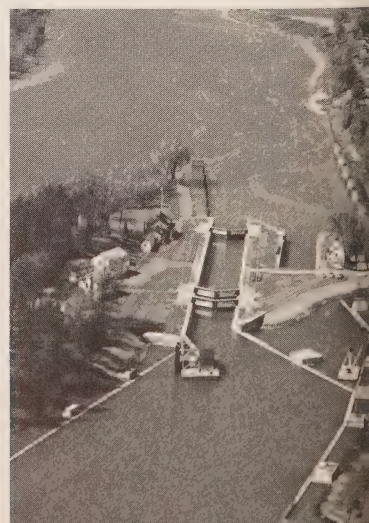
Mobile aircraft noise monitoring station.



Electronics engineer aboard a specially equipped D.O.T. aircraft checks the operating efficiency of radio aids to air navigation.



A DC-8 at Winnipeg International Airport.

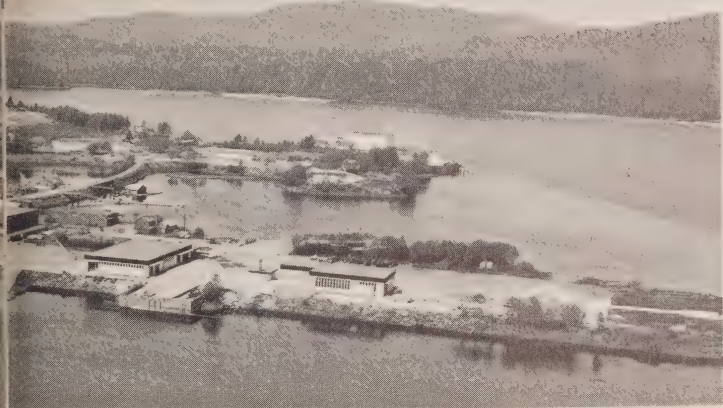


Aerial view of St. Ours Lock, Richelieu River, P.Q.

Aerial view of the Carillon Lock, Ottawa River.



nce Rupert Marine Agency, B.C. (Foreground).



Air Traffic Control Centre, Montreal International Airport.



Launching the sounding vessel CCGS Nicolet at Collingwood Shipyard, Ont., August 20, 1966

Tabular Report of Aids to Navigation

Statement, by Districts, showing the Number and Type of Buoys and Other Markers for the Fiscal Year ended March 31, 1967.

District	Light Buoys	Sound Buoys	Light and Sound Buoys	Total Light and/or Sound Buoys	Floats, Cans, Spar Buoys	Total Buoys	Unlighted Dolphins	Stakes Bushes and Balises	Unlighted Day (Shore) Beacons	Total Unlighted Beacons Stakes, Etc.
St. John's, Nfld.	59		36	95	165	260		8	62	70
Charlottetown, PEI	130		49	179	1,045	1,224		1,897	7	1,904
Dartmouth, N.S.	83	17	180	280	1,225	1,505	4	28	31	63
Saint John, N.B.	34		92	126	771	897	692		28	720
Quebec, P.Q.	118		40	158	84	242	14	28	15	57
Sorel, P.Q.	393			393	1,228	1,621		3	32	35
Parry Sound, Ont. and Sub-Agencies	116		16	132	2,038	2,170		3	415	418
Prescott, Ont.	311	10	13	334	825	1,159		125	2	127
Victoria, B.C.	51		25	76	180	256	122		239	361
Prince Rupert, B.C.	3		21	24	72	96	3	80	142	225
Hay River, N.W.T.	24			24	523	547		38	894	932
Totals	1,322	27	472	1,821	8,156	9,977	835	2,210	1,867	4,912

Construction—The program of providing fixed piers in the St. Lawrence River to make navigation safer because of the increase in shipping continued. Brule Bank ranges and the back piers for the two ranges at Curve 2 in Lake St. Peter went into operation during the winter. Construction of five piers for three ranges in Lake St. Francis was started and 65 per cent complete by the close of navigation. Pre-engineering and site investigation and borings were completed for other ranges in Lake St. Louis, and for lightpiers in Lake St. Peter, and Lurcher Shoal, N.S.

To improve living conditions and provide accommodation at new lightstations, 23 new dwelling units were completed. In addition, 38 light towers and three machinery buildings were completed. Improvement in access roads to lightstations continued and five were completed during the year.

At the Charlottetown, P.E.I., marine agency a new stores office building was completed and work started on the construction of the new shops building.

Mechanical Equipment—To facilitate servicing marine aids, supply operations, and handling heavy equipment and material at depots, a number of mobile units, including automobiles, trucks and heavy hydraulic cranes, were supplied to various districts as replacements or new equipment. Snowmobiles have proven an asset in providing transportation for personnel at lightstations during winter months where snowploughing is impractical or impossible.

Bulk fuel storage established at lightstations and delivery of oil products by barge or other bulk methods, instead of barrels, is resulting in considerable savings and a reduction in the inventory cost of barrels. Using fiberglass reinforced plastic tanks is a great improvement, as the light weight greatly facilitates their handling over difficult terrain during initial installation, and their upkeep requirements are a bare minimum.

Fiberglass reinforced plastic buoys, used successfully by other authorities, are under study. An order for 300, manufactured in Great Britain, has been placed to mark distinct small-boat channels in the St. Lawrence and Ottawa Rivers in connection with Expo 67, and will be permanently maintained.

Several modifications on existing type steel buoys were made to improve handling and to reduce manufacturing costs.

Tests on two steel alloys for chain moorings continued with a view to improvements and cost reductions over mild steel chain moorings. Interest in the use of synthetic ropes was renewed and the Expo buoys will be moored with braided nylon ropes.

Evaluation reports of the Canadian-made fog signal (Airchime), installed one and two years ago, are very encouraging, proving to be a very efficient type of signal compared with the diaphone types that have been in use for many years.

Electrical Equipment—The evaluation of light sources was continued during the year for the purpose of producing a comprehensive source of information for determining light equipment types for District use.

Specifications for solid state flashers were prepared and new equipment to these specifications from various suppliers is now being evaluated.

The distinctive scintillating Xenon light manufactured in Great Britain has been procured for use on the special small-boat channel in the St. Lawrence and

Ottawa Rivers in connection with Expo 67. All Districts, as well, are being supplied with this type of flashing light for evaluation during 1967.

At Cape Negro, N.S., an extensive test was started to evaluate a remotely controlled installation. Included in the test is the evaluation of two makes of fog detectors and an electronic fog signal.

To offset the increased load requirement at lightstations, new electric generating sets of larger capacity and capable of being paralleled with other units to take care of peak loads, are now being supplied.

Navigable Waters Protection Act

On October 1, 1966, the Minister of Transport assumed the administration of the Navigable Waters Protection Act, formerly administered in part by the Minister of Public Works.

Since then, 274 applications have been approved and 25 that could not meet the requirements of the Act were rejected. Of 58 requests for prior consent, 46 were approved. Twenty works constructed or proposed, were investigated as a result of protests and where the work was found to substantially interfere with navigation, approval under the Act was not given. In one case an order for removal was issued.

Canals

Pleasure boat traffic on the Trent and Rideau canals again showed a substantial increase in the 1966 navigation season. Lockages through the Trent totalled 129,971, a 10 per cent increase over 1965, and through the Rideau, 51,590, a six per cent increase. The Ottawa River canals also showed traffic increases with the Carillon increasing by seven per cent and the Ste. Anne by 13 per cent.

Freight tonnage on the Canso Canal showed an increase, with a total of 1,179,492 tons.

The capital rehabilitation program on the Trent Canal system continued throughout the year, with the main contract for the mechanization and modernization of the Kirkfield Lift Lock 95 per cent completed. The guard gates at this lock site were restored, and the steel towers were encased in concrete.

Replacement of Locks 28 and 29 at Burleigh Falls, Ont., with a single lock was 75 per cent completed by the end of the fiscal year, with opening of the new lock scheduled by June 1967.

Hydraulic mechanization of valves and gates at Locks 16, 17 and 35 was completed and the mechanization of Lock 42 was 60 per cent completed. The final phase of the rehabilitation and modernization of Lock 21, Peterborough Lift Lock, was 90 per cent completed. Concrete restoration work was carried out at various locks, dams, and piers throughout the Trent System.

Pre-engineering work was completed on the new Trent Canal headquarters shops and office building to be erected in Peterborough, and work was started on the design of the new building.

On the Rideau Canal, construction commenced on the new canal wall between Laurier Avenue and Plaza Bridges and was 80 per cent completed at the end of the fiscal year; new entrance wharves were constructed at Edmonds and

Old Slys Lock Stations; the entrance wall at Old Slys was rebuilt; new entrance walls and wharves were built at Chaffey's lock site, and the dam at Bobs Lake was rebuilt.

The site for the new Rideau Canal headquarters in Smiths Falls was surveyed and the building is being designed.

On the Chambly Canal, the west wall of Lock 8 was rebuilt with reinforced concrete and other sections of the canal were either replaced or rebuilt to keep the canal navigable; pre-engineering surveys and studies were carried out with a view to replacing the Canal.

A contract for steel gates for the new St. Ours dam was awarded and work started, scheduled for completion in 1969. Reconstruction of the upper entrance wall of the Ste. Anne canal was completed.

At the Canso canal, a new steel storage building was erected and a new administration building at St. Peters canal was completed.

Harbours and Property

Harbour Commissions—The new Harbour Commissions Act of 1964 was adopted by the Harbour Commissions at Oshawa, Ontario, effective December 1, 1966, and at Windsor, Ontario, effective March 1, 1967, making a total of five Harbour Commissions operating under the new Act. The others are Fraser River, Lakehead and Nanaimo.

Cargo handled by harbour commissions totalled 53,702,000 tons, an increase of 1,639,000 tons. Of this total the Lakehead handled 19,504,000 tons, followed by Hamilton with 10,657,000 tons, North Fraser, 6,888,000, Toronto, 5,701,000, and Fraser River, 5,429,000.

Revenue earned totalled \$9,567,000, an increase of \$1,075,000 over 1965. A revised schedule of charges at Nanaimo, B.C., was confirmed by the Governor in Council; a new tariff of berthage charges was authorized at Hamilton; and cargo rates at Toronto were increased to meet substantial increases in labour and operating costs.

Public Harbours—Effective March 1, 1967, the harbour of Fortune, Newfoundland, was proclaimed a public harbour. There are now 315 such harbours, of which 115 are under the supervision of harbour masters appointed to enforce Public Harbours Regulations, including collecting harbour dues. In the fiscal year, harbour dues collected totalled \$549,771, an increase of \$26,709 over the previous year.

Cargo handled in the ten major public harbours in 1966 totalled 56,631,000 tons, an increase of 6,063,000 over 1965. Of this, Sept Iles had 20,101,000 tons; Baie Comeau, 8,415,000; Sorel, 5,128,000; Sault Ste. Marie, 5,063,000; Sarnia, 4,367,000; Port Alfred, 4,237,000; Sydney and North Sydney, 3,558,000; Victoria, 2,445,000; Hantsport, 1,883,000; and Prince Rupert, 1,525,000.

Wharves—Of some 3,000 wharves, piers and breakwaters under the administration of the Department, 510 are in charge of wharfingers. Wharf revenues totalled \$1,192,197, an increase of \$114,554 over last year.

Arrangements are being completed for a detailed survey of Federal small boat harbours on the West Coast.

Summary of Revenue and Traffic—1966

	1966	% of Total
GROSS REVENUES		
Harbour Commissions.....	\$ 9,567,000	20.1
Public Harbours and Wharves		
Harbour Dues.....	553,294	1.2
Wharfage.....	1,912,590	4.0
	12,032,884	25.3
National Harbours Board.....	35,559,425	74.7
TOTAL.....	\$47,592,309	100.0
TRAFFIC		
	1966—(000 Tons Cargo)	
Harbour Commissions.....	53,702	20.9
Public Harbours and all Wharves+.....	127,023	49.4
	180,725	70.3
National Harbours Board.....	76,188	29.7
TOTAL.....	256,913	100.0

+A net figure obtained from D.B.S. reports includes private wharf traffic.

Marine Regulations

Of the 33 regulations in effect to provide for uniform enforcement of Parts II and VII of the Canada Shipping Act, two were completely revised during the year, and 11 others were amended to bring them into conformity with the Inter-Governmental Maritime Consultative Organization's amendments to the 1960 Safety of Life at Sea Convention. The amendments include stability requirements for fishing vessels and marine electric requirements for all ships.

Drafting new regulations or standards continued covering manning of ships; ships' automated and remote control systems; construction of tankers; sewage and garbage pollution prevention; dangerous bulk cargoes; and load line rules for fishing vessels. Where necessary, proposals have been sent to industry for comments.

Eleven accidents and five fatalities that occurred during loading and unloading ships were investigated, compared with 18 and 13 respectively the previous year.

Water Pollution

During the navigation season, helicopter patrols were continued over the St. Lawrence River to check on pollution of the waters by oil, and initiated by fixed-

wing aircraft over Lake Superior. Fifteen prosecutions for violations of the Oil Pollution Prevention Regulations were instituted, 14 of which resulted in conviction.

Marine Safety

During the year, meetings related to marine safety on the St. Lawrence and on the west coast were held at Dorval and Vancouver respectively, with the various segments of the shipping industry participating.

The general objective of these studies is to achieve and maintain a state of overall efficiency in the management and safe conduct of ships at sea and in port, so that all phases of operation are conducted with security and dispatch.

Lifejackets—The research program was extended to child-size lifejackets, the Canadian Red Cross Society undertaking a special investigation to develop a more efficient type. The sum of \$3,000 was contributed by the Department to cover expenses involved.

Capacity Plates—Capacity plates issued recommending safe load and horsepower for certain categories of pleasure boats totalled 40,865.

Safety Afloat—Demands for the publication, *Safety Afloat*, designed to promote water safety in pleasure boat operations increased, and 350,000 copies of the 1966 edition were distributed to the boating public.

Marine Engineer Examinations

Candidates examined for certificates of competency as marine engineers totalled 1,276, an increase of 17 per cent over last year. Of these, 870 received certificates and 245 obtained partial passes. In addition, because of the increased demand for qualified engineers, 770 permits were issued permitting individuals to act as engineers on ships.

Inspections

At the request of the St. Lawrence Seaway Authority, 77 inspections were made of ships reported to be damaged and their capability of making a safe passage through the Seaway was in doubt.

Wave-Climate Study

The wave-climate study of the Great Lakes and Upper Gulf of St. Lawrence, undertaken to provide information as a basis for revising the Great Lakes Load Line Rules continued. As a result of progress made, a Joint Technical Committee to consider Great Lakes Load Lines was set up with the United States Coast Guard and representatives from classification societies, shipbuilders and shipowners. The first meeting was held in Ottawa on January 19, 1967.

S.S. Corfu Island

The wreck of the *S.S. Corfu Island*, abandoned in the Magdalen Islands, was pulled ashore and all traces of oil were removed. Undertaken by Marine Industries Limited at a cost of \$383,000, this work was necessary to prevent oil pollution of the neighbouring beaches and surrounding waters of the Gulf of St. Lawrence.

Conferences

The Department participated in 13 meetings of the Inter-Governmental Maritime Consultative Organization held in London, England, at various times during the year.

Ship Registration

During the year, 1,543 vessels were measured for tonnage by district measuring surveyors and the forms were checked by headquarters staff.

Small vessels exempt from registration and licensed under the *Small Vessel Regulations* totalled 53,977, making a grand total of 673,182 such vessel licences issued throughout Canada up to December 31, 1966. During the same period, 1,663 vessels were added to the Canadian registry and 659 were removed, making a net increase of 1,004. At the end of December 1966, there were 25,735 vessels totalling 3,550,786 gross tons registered in Canada. The number and tonnage by Provinces were as follows:

<i>Province</i>	<i>No. of Ships</i>	<i>Gross Tonnage</i>
Newfoundland.....	947	125,221
Nova Scotia.....	7,432	193,372
Prince Edward Island.....	1,046	24,187
New Brunswick.....	2,604	143,851
Quebec.....	3,099	1,072,423
Ontario.....	2,549	1,115,695
Manitoba.....	110	19,505
Saskatchewan.....	1	108
Alberta.....	12	736
British Columbia.....	7,929	854,253
Yukon Territory.....	6	1,435

Port Wardens

Under the Canada Shipping Act, port wardens are appointed to administer regulations for the safe carriage of grain and timber deck cargoes and the stowage of concentrates. These cargoes are particularly liable to endanger a ship either because of their tendency to shift or otherwise affect the stability during a sea passage. Control measures include the requirement to calculate the stability of grain ships, to limit the height of deck cargoes of timber, and to dry concentrates to prevent their becoming fluid in transit. The Concentrates Code, published by the Nautical and Pilotage Division, has been adopted by the Inter-Governmental Maritime Consultative Organization as the basis for international safety practices.

Departmental officers act as port wardens in ten ports and districts, and in eight ports and districts there are fees-of-office appointees. Separate acts provide for port wardens at Montreal and Quebec City.

A major overhaul and consolidation of the regulations which the port wardens apply was continued in 1966 together with a re-assessment of the tariff of fees in order to promote uniformity throughout the country. The new regulations are expected to come into force in 1967.

Pilotage

There were 387 licensed pilots engaged in the nine districts for which the Minister is the pilotage authority—Sydney, Bras d'Or Lakes, Halifax, Saint John, Quebec, Montreal, Cornwall, British Columbia and Churchill.

They performed 39,922 pilotages inward or outward and 13,608 movages, grossing \$7,435,871.34 in fees.

Pilotage in three districts—District No. 1, Cornwall to Kingston; District No. 2, Port Weller to Sarnia; and District No. 3, the Lakehead and St. Mary's River—is carried out as a joint operation between Canadian and United States authorities.

Cornwall to Kingston—Twenty Canadian pilots performed 1,934 pilotages, netting \$365,332.60 in fees.

Port Weller to Sarnia—Forty-five pilots performed 4,403 pilotages, netting \$692,607.50 in fees.

The Lakehead and St. Mary's River—Four pilots employed to conduct ships through the St. Mary's River and into ports on Lakes Huron, Michigan and Superior netted \$56,945.66.

Labrador—Two pilots were employed by the Department to assist ships in and out of Goose Bay as required during the navigation season.

Royal Commission on Pilotage

The report of this Commission is under preparation.

Marine Casualties

Preliminary inquiries into shipping casualties totalled 36, and there were two formal investigations.

Masters, Mates and Seamen

At 105 Canadian ports 41,494 seamen were engaged to serve in ships of Canadian registry and 42,814 were discharged.

During the year, 3,678 nautical examinations were held, and a total of 1,751 certificates of competency, service and efficiency were issued.

Marine Hydraulics

Hydraulics Studies—Throughout the year, intensive preliminary feasibility engineering studies continued in preparation of a joint engineering-economic report on methods of improving water depths in the St. Lawrence Ship Channel. The large hydraulic model of the St. Lawrence River at Ville LaSalle, covering the reach from

Montreal to Trois-Rivieres, operated throughout the year and produced valuable results relative to various improvement schemes under study. In August 1966, Montreal port authorities and representatives of the National Harbours Board were taken on a tour of the models and brought up to date on the scope and progress of the studies.

A co-ordinated program of tidal hydraulics investigation in the St. Lawrence River downstream of Montreal was initiated. Besides promoting scientific research of the tidal phenomena, these studies are necessary in investigating and developing engineering projects which might form part of the overall planning for river improvements. Participating with the Department in this program are the National Research Council, the Department of Energy, Mines and Resources, and the Department of Public Works. One of the highlights of the study will be an hydraulic model of the St. Lawrence River reproducing to a scale of 1:2000 the reach from Montreal to Father Point, a distance of approximately 340 miles. The model is being constructed by the National Research Council, and will be completed in 1967.

A program of investigation and study of ice problems in the St. Lawrence River below Montreal was initiated with a view to developing better methods of ice control and flood prevention, in conjunction with the Department's icebreaker operations.

The Department continued to participate in the activities of the International Joint Commission (IJC) in connection with water levels of the Great Lakes-St. Lawrence River system. Involvement with the present Lake Ontario control continued through the Department's membership in the IJC's International St. Lawrence River Board of Control and its on-site Operations Advisory Group. Contribution is also continuing, through Board and Committee membership, to the IJC studies concerning the possibilities of further regulation for any or all of the Great Lakes.

St. Lawrence Ship Channel—Technical studies were made and reports completed on (a) the Lake St. Peter project, involving channel relocation, dyking and the construction of control works, and (b) dredging, without attendant control works, but including the deposition of spoil for optimum water level retention.

During the early part of the 1966 navigation season, water levels dropped steadily, reaching one foot over datum by the beginning of July and decreasing more slowly to chart datum by early October. Levels remained within a range of one foot over datum until the end of November, when heavy precipitation, particularly in the Ottawa River Basin, caused a rapid rise in levels about two feet over datum and remained so until the end of the year.

For the first time since the 1961 season, no levels were published below chart datum. In 1965, there were 74 consecutive days of below chart datum levels.

Completion of the widening project between Batiscan and Cap a la Roche at mid-season provided a minimum channel width of 800 feet in the entire Trois Rivières-Québec reach.

The work designed for the second year of a three-year contract for widening the channel to 800 feet between Montreal East and Vercheres was completed.

A two-year contract for dredging a turning area at Port St. Francis was completed and made available to navigation in mid-season.

A contract was awarded for deepening the St. Fulgence to Chicoutimi channel in the Saguenay River to 20 feet at lowest normal tides, and widening the upstream part of this channel to 400 feet from the previous 250 feet. The contract included dredging the basin along the wharf to a depth of 30 feet at lowest normal tides. This contract was completed except for minor clean up.

A contract for dredging the Poulieu de la Longue Pointe shoal in Montreal Harbour up to 30 feet was also completed except for minor clean up.

Following requests from pilots for improvement of the Lake St. Louis approach to the South Shore Canal in the interest of navigational safety, a contract was awarded to C. A. Pitts, General Contractors Limited, for widening the channel between Buoys 1A and 5A to 600 feet from the original 450 feet. This additional width was made available to navigation at the end of the season.

Normal depths were restored at Cap Brulé and East Narrows below Quebec, and at Batiscan Anchorage and St. Ignace opposite Sorel.

Work carried out for the National Harbours Board included maintenance sweeping in Montreal Harbour, at all berths in Trois Rivières Harbour, and in the St. Charles River and Wolfe's Cove in Quebec Harbour.

In the St. Lawrence above Montreal, all non-canal reaches of the Canadian sections were swept to design grade.

The contract for reconstructing Sorel weirs 2, 3, 4 and 5 was completed. A subsequent field survey showed an increase of six inches in water surface elevation at Sorel and over three inches in Montreal, confirming the results that had been observed on model tests.

For the preliminary survey of the twin-channel proposal below Quebec, metering of velocities was carried out in the Beaujeu West Narrows, Stone Pillar, Grosse Ile, Ile à Durand and Seal Island areas, together with soil bearings, seismic survey and river bottom soil sampling.

In connection with the study of the tidal behaviour of the St. Lawrence River, discharge measurements were made just upstream of the Quebec Bridge over a period of a month, late in the 1966 season.

Data already collected for the Ville LaSalle models were supplemented by additional measurements for use in the National Research Council and Department of Energy, Mines and Resources models stretching from Laprairie Basin near Montreal to Pointe au Père. Some 60 staff gauges recorded water levels in 1966, and flow measurements were made in 22 separate river arms.

Winter surveys, particularly on Lake St. Peter, included gathering data on wind velocities, water levels, ice thickness and river-bed samples. Helicopters were used, supplemented by photogrammetric surveys conducted under contract to determine surface current velocities.

An inventory was prepared which classifies the shore property in the Montreal-Trois Rivières reach and by which adverse effects or benefits will be measured in the evaluation of proposed Great Lakes regulation plans. A preliminary report recommending water level grade lines was submitted to the Shore Property Subcommittee in February 1967. This activity represents part of the Department of Transport share of the consideration of downstream interests in the international Great Lakes Water Levels Study.

Marine Traffic Control—The recommendations of the working group on marine traffic in the St. Lawrence were published early in 1966 and upon these recommendations a marine traffic control division within the Marine Hydraulics Branch was set up in May 1966 to implement the program, operate the system and co-ordinate it with other government agencies.

The plans of the system were based upon those of air traffic control utilizing VHF radio equipment.

As an immediate short-term arrangement, the department issued all river pilots with walkie-talkies and devised an operational procedure to best utilize the equipment for safety purposes.

During the year the installation and testing of the field equipment, the recruiting and training of personnel and the necessary co-ordination with all the various agencies was accomplished.

Due notification by *Notices to Mariners* has been given and the overall marine traffic control system will come into being on April 3, 1967.

Canadian Coast Guard

Two new ships were added to the fleet and two were withdrawn during the year. CCGS *Nicolet*, a sounding-survey vessel for St. Lawrence Ship Channel work, replaced the CCGS *Frontenac*, and CCGS *Vancouver* replaced CCGS *St. Catharines* for Ocean Station *Papa* duties in the Pacific. In addition, a prototype 44-foot lifeboat was obtained and is now being evaluated in the inshore rescue role at Clark's Harbour, Nova Scotia. The *Sambro* lightship was withdrawn during the year.

At the end of the year the fleet consisted of more than 200 vessels of all types of which 60 are of watchkeeping size. These include 10 full icebreakers, eight light icebreakers, 11 buoy and supply tenders, 10 rescue cutters, six northern supply vessels, three weatherships, one Arctic patrol ship, one icebreaker cable repair ship, five Ship Channel survey vessels, two lightships, four Mackenzie River shallow draft vessels, one Great Lakes research vessel, four shore-based lifeboats, and 112 landing craft and barges of various types.

Northern Operations, 1966—The annual Arctic resupply operations delivered 100,675.2 tons of cargo to 70 ports of call. Existing aids to navigation were serviced throughout the area and direction finding stations were calibrated.

CCGS *C. D. Howe* carried out her seventeenth annual Eastern Arctic Patrol on behalf of the Departments of National Health and Welfare, and Indian Affairs and Northern Development.

The ice operations office opened at Churchill, Manitoba, on July 15 and provided advice to shipping and trading into Hudson Bay and Strait during the season. Where necessary, the Coast Guard icebreakers *Montcalm* and *N.B. McLean* supported shipping along the route.

In all, 16 Coast Guard ships participated for a total of 1,322 ship days and steamed a total of 166,653 miles.

Winter Icebreaking—The ice operations office at Sydney, N.S., commenced its seventh season on December 15. The above-average temperatures in December 1966 and early January 1967, had indicated that the season would be fairly rou-

tine, but the well-below average temperatures experienced throughout the period late January to mid-March changed the outlook considerably and Coast Guard icebreakers were hard pressed to maintain adequate escort of shipping. From December 15, 1966, to March 31, 1967, a total of 435 vessels were reported through Ice Sydney, an increase of 26 vessels for the same period last season.

An ice formation office was established at Quebec for the first time. The office, located in the Pilotage Building, commenced operations early in January, providing shipping with daily summaries of ice conditions for the area from Baie Comeau to Portneuf.

In the St. Lawrence Ship Channel, first reports of drifting ice came on December 20 and the first of four icebreakers reported at Trois Rivières on December 22. Throughout January temperatures were above average, the first jams occurring on January 28. Heavy jams occurred in the early part of February in the Lake St. Peter to Lanoraie area, and the four icebreakers were fully committed above Sorel. The ice cover reached MacKay Pier, Montreal, on February 17 and two icebreakers opened the channel to Montreal East on February 21.

Jams were occurring every day on Lake St. Peter towards the end of March and icebreakers had considerable trouble clearing the Seaway entrance at St. Lambert Lock on March 23. CCGS *Ernest Lapointe* and CCGS *N.B. McLean* moved into Lake St. Louis on March 23 and were working in this area until the end of March. By March 23, ice was moving freely between Montreal and Trois Rivières.

Water levels remained comparatively low until well into February, but rose to a maximum of 20'4" above chart datum in Montreal upper harbour on February 22. At this time, because of reduced current velocity at the ice control structure, it was possible to obtain a complete ice cover on Laprairie Basin by lowering the stoplogs. The channel was opened to the upper harbour on March 4.

Icebreaking above Montreal started on March 16 and extended up to and including Lake St. Francis.

In the Saguenay River, as demands elsewhere were particularly light, it was possible to meet a request to clear a track to Port Alfred where the first merchant ship arrived on March 5. CCGS *Montcalm* completed operations in the River from March 29 to April 2.

CCGS *Simcoe* left Prescott, Ontario, on March 15 and commenced icebreaking and buoy work towards Toronto. The CCGS *Alexander Henry* commenced icebreaking in the Collingwood area on March 28.

Hamilton Inlet and Lake Melville—An experimental probe was carried out by CCGS *John A. Macdonald* from April 13 to April 21, 1966. The vessel reached Goose Bay Narrows on April 14. An attempt was made to escort the *Chesley A. Crosbie* into Goose Bay on December 28. Although three icebreakers attempted to assist her, exceptionally heavy ice conditions prevented entry and the attempt was abandoned on January 3, 1967.

Scientific Operations—The main scientific work during 1966 northern operations was carried out by the major icebreakers, CCGS *Labrador*, *John A. Macdonald* and *d'Iberville*.

In the Eastern Arctic, ice freeze-up and break-up patterns were studied at Milne Inlet and extensive detailed magnetic and bathymetric surveys were carried out in Ungava Bay and Hudson Strait. Numerous ocean stations were occupied to obtain temperature and sea water samples, and considerable hydrographic and bathymetric data was collected during the probe of CCGS *Labrador* into Makinson Inlet in Ellesmere Island.

In the Western Arctic, the Victoria based CCGS *Camsell* carried out extensive hydrographic surveys, and achieved the distinction of being the first ship to circumnavigate King William Island.

CCGS *Porte Dauphine* continued to be operated on behalf of the Meteorological Branch and the Great Lakes Institute. More time was spent on special studies in 1966 rather than on the normal synoptic program.

Cable Ship—CCGS *John Cabot*, which is chartered to the Canadian Overseas Telecommunication Corporation during cable operations, spent considerable time in September and October in cable burying trials off the New Jersey Coast. Following these trials, the ship was sent to the high Arctic in December to repair an under-sea telephone cable. This was the second time the ship had been called upon to work so far north and was the first time that cables had been repaired in heavy ice conditions. During this operation, the cable ship was supported by Canadian and United States Coast Guard icebreakers.

Weatherships—CCGS *St. Catharines* and CCGS *Stonetown* continued their patrols of Ocean *Papa* in the North Pacific on an alternating basis during 1966. The new CCGS *Vancouver* is expected to sail on her maiden patrol early in April 1967 to relieve CCGS *Stonetown*, and CCGS *St. Catharines* is being decommissioned. The new CCGS *Quadra*, sister ship to the *Vancouver*, has been accepted and, following operational trials, will assume Ocean Weather Station duties with the *Vancouver*. CCGS *Stonetown* will be decommissioned when the *Quadra* is fully operational.

Search and Rescue—Canadian Coast Guard units participated in a total of 656 incidents—West Coast, 387; Great Lakes, 114; and East Coast, 155.

Training—The Canadian Coast Guard College, at Point Edward, N.S. started its second year in September 1966 with the enrolment of 48 additional cadets. The College opened with some 40 cadets enrolled.

Correspondence courses were continued, with an enrolment of 84. Based on proven proficiency in these courses, 20 scholarships were awarded to deck and engineer officers aspiring for higher grade qualification.

Thirty Coast Guard masters and officers attended a one-week course in search and rescue techniques given by the Coast Guard Rescue officers of the Central and Maritimes regions. Exercises were carried out using both Coast Guard cutters and search and rescue aircraft.

Approximately 100 Coast Guard officers and men were awarded first aid certificates during the year; of this total, 31 were second-year College cadets. Fifteen Coast Guard officers attended weather observing courses at Halifax and Montreal. Ten officers attended the Royal Canadian Navy fire-fighting and damage control course, and some 30 Coast Guard cooks and stewards were given a three-week course in food preparation at the Nova Scotia Technical Institute.

Twenty Coast Guard engineers attended an electrical training course at Canadian Westinghouse Company, Moncton, N.B., and negotiations for a course in digital boiler control systems have been completed with Bailey Meter Company, Cleveland, Ohio. Some 20 Coast Guard engineers will take this course.

Ship Construction

During the fiscal year five vessels were completed, 11 were under construction, and 20 were in the design stage.

Vessels completed for the Canadian Coast Guard were the *Nicolet*, for St. Lawrence Ship Channel work; and weatherships *Vancouver* and *Quadra*, which will maintain the Pacific Ocean Weather Station; the *E.E. Prince*, a pelagic fisheries vessel, for the Fisheries Research Board, and the *Chebucto*, a fisheries protection vessel, for the Department of Fisheries, both for service on the East Coast.

Vessels under construction were the triple screw icebreaker, *Louis S. St-Laurent*, for service in the Maritimes and Northern areas; an icebreaking supply and buoy vessel, *J. E. Bernier*, for service at Quebec, P.Q.; an icebreaking supply and buoy vessel for service at Sorel, P.Q.; a search and rescue cutter for service on the East Coast; three ferries for Canadian National Railways—M/V *Ambrose Shea*, for service between North Sydney and Argentia, Nfld., M/V *John Hamilton Gray*, for service between Cape Tormentine, N.B., and Borden, P.E.I., and M/V *Frederick Carter*, for service between North Sydney, N.S., and Port aux Basques, Nfld.; two pilot vessels for the Department's pilotage service at St. John's, Nfld. and Sydney, N.S.; and a Department of Fisheries protection vessel for service on the West Coast.

In the design stage were five search and rescue vessels for service on the East and West Coasts; a replacement vessel for CCGS *Grenville*; a replacement vessel for CCGS *Brant*; a replacement vessel for CCGS *Detector*; a tender for the Saint John River, N.B.; a replacement vessel for CCGS *Sea Beacon*; a replacement for CCGS *Estevan*; three supply vessels for northern operations; a tender for the Lakehead; a 67-foot survey/workboat for the St. Lawrence Ship Channel; a replacement vessel for the Agency tender, *Parry Sound*; a tender for Amherstburg, Ont.; a replacement for the CCGS *C. P. Edwards*; and a pilot vessel for service at Prince Rupert, B.C.

Miscellaneous—Various small vessels for this department and others have been delivered or are under construction.

Repairs—Under the supervision of the Ship Construction Branch, repairs totalling \$2,790,000.00 were carried out on Canadian Coast Guard ships, and alterations and additions expenditures totalled \$1,100,000.00.

Inter-Governmental Maritime Consultative Organization (IMCO)

Marine Services, in collaboration with the Telecommunications and Meteorological Branches of Air Services and with other government departments, is responsible for Canadian liaison with the Inter-Governmental Maritime Consultative Organization.

Canada is a member of this specialized agency of the United Nations which deals specifically with maritime matters. During 1966 membership rose to 64 States, which include most of those States eligible for UN membership having an

appreciable maritime interest, either as a consumer or supplier of shipping services. The department represents Canada at IMCO General Assemblies, and on the Council and Maritime Safety Committees where Canada is an elective member. In the technical sub-committees of the Maritime Safety Committee, Canada is represented by the technical officers of the department in studies which lead to international agreements to standardize matters of shipping safety. A new International Convention on Load Lines was signed, subject to ratification, on behalf of Canada during 1966, replacing an earlier Convention of 1929 vintage but continuing in the spirit of Samuel Plimsoll whose efforts in the nineteenth century led to the establishment of the *Plimsoll Mark*.

During 1966 necessary domestic action was undertaken in preparation for the ratification of the Convention on the Facilitation of International Maritime Transportation, 1965. This Convention, which came into force on March 5, 1967, will result in considerable reduction in the number and complexity of government forms required of international shipping.

An extraordinary session of the IMCO Assembly in 1966 adopted far-reaching amendments to the fire safety precautions of the International Convention on the Safety of Life at Sea. This arose out of recent catastrophic fires on foreign flag cruise vessels. The delegation from the department, on behalf of Canada, supported these amendments which bring the safety standards of foreign vessels more nearly into line with Canadian practice.

To implement the system of marine traffic control established in the St. Lawrence River, during 1966 Canada introduced a proposal to amend the International Convention on the Safety of Life at Sea. The proposal concerns the designation of areas of high traffic density and makes provision for the compulsory use by ships of a very high frequency (VHF) radio telephone communication system. This Convention amendment will be considered for adoption by the Assembly of IMCO during 1967.

TRANSPORTATION POLICY AND RESEARCH

The Transportation Policy and Research Branch was formed during the past year by the amalgamation of the Railway and Highway Branch and Economic Studies Branch. It was formed to undertake economic and technical research into all modes and forms of transportation; to assist in the development and formulation of transportation policies; and to advise on legislation in all fields of transportation. The Branch is staffed by a group of professionals with training in the fields of economics, statistics, commerce, geography, business administration and engineering, with experience in railway, shipping, trucking and airline companies.

The Branch also has responsibility for the control and audit of expenditures undertaken by Canadian National Railways on behalf of the Federal Government, such as ferry operations and railway construction. Responsibility has also been assigned for financial audits on ferry operations subsidized by the Canadian Maritime Commission. Expert advice is also provided on various financial matters such as loans and advances to Crown Corporations responsible to the Minister, CNR pension funds, and railway subsidies in general.

A major responsibility during the past year was in connection with development of the National Transportation Act. In addition, 20 research projects were undertaken and completed, and five projects were undertaken for the department by consultants.

RAILWAY SERVICES

Canadian National Railways

Canadian National Railways operated at a deficit of \$24,593,217 in the calendar year 1966, compared with a deficit of \$33,414,884 the previous year.

Air Canada

Air Canada operated at a profit of \$2,909,878 in 1966, compared with a profit of \$3,989,960 in 1965.

Prince Edward Island Ferry and Terminals

The deficit in the operations of this service for the calendar year 1966 amounted to \$4,550,968, compared with \$4,208,451 for 1965, an increase of \$342,517.

In the fiscal year 1966-67, payments made on ferry construction amounted to \$5,335,449, and dock construction totalled \$95,143 for Borden and \$267,516 for Cape Tormentine.

Vehicle traffic increased 5.8 per cent from 265,778 in 1965 to 281,405 in 1966. Freight decreased from 895,360 tons in 1965 to 733,733 tons in 1966, and passengers increased from 665,944 to 679,603 in 1966.

Newfoundland Ferry Service

In addition to the regular North Sydney-Port aux Basques service, a freight service only is operated from North Sydney to various other Newfoundland ports as required by traffic conditions. In 1964 construction started on the terminal requirements and vessel for a new vehicle and passenger service to operate to Argentia, Nfld.

The deficit in the operation of this service amounted to \$12,998,939 in 1966, compared with \$12,368,009 for 1965, an increase of \$630,930.

Yarmouth, N.S.-Bar Harbor, Me., Ferry Service

Traffic handled during 1966 by this service consisted of 94,490 passengers, 27,338 cars, 3,282 trucks and 1,334 other vehicles, compared with 93,430 passengers, 27,688 cars, 3,312 trucks and 1,051 other vehicles in 1965.

Maritime Freight Rates Act

Payments made under this Act during 1966-67 amounted to \$14,335,158, compared with \$15,054,696 the previous year, a decrease of \$719,538.

Supplemental Pension Allowances

Supplemental pension allowances payable by the Government of Canada to retired former Newfoundland railway, steamship and telecommunication employees transferred to Canadian National Railways amounted to \$264,000 compared with \$252,132 for the same period last year.

Victoria Jubilee Bridge

In 1966 the operating costs of this bridge totalled \$841,421, compared with \$805,495 in 1965.

Great Slave Lake Railway

Approximately 430 miles in length, this line extends from Grimshaw, Alta., to Hay River, N.W.T. a distance of 377 miles, with a branch to Pine Point Mines, a further distance of 53 miles. It is expected to be completed by March 31, 1970. Accountable advances for 1966-67 amounted to \$1,326,000, bringing the total advance to date to \$69,551,000.

FINANCIAL SUMMARY

Comparative Summary of Expenditures and Revenues for the Fiscal Years Ended March 31, 1966 and 1967

Millions of Dollars

	1966-67	1965-66	Increase (+) or Decrease (-)
<i>Administration, Operation and Maintenance</i>			
<i>Expenditures</i>			
Departmental Administration.....	5.6	4.4	1.2 (+)
Air Services.....	113.0	100.5	12.5 (+)
Marine Services.....	50.6	44.5	6.1 (+)
Railway and Steamship Services.....	59.6	76.3	16.7 (-)
Miscellaneous Services.....	198.8	171.6	27.2 (+)
General.....	.3	.2	.1 (+)
	427.9	397.5	30.4 (+)
<i>Capital Expenditures</i>			
Departmental Administration.....	.4	—	.4 (+)
Air Services.....	52.0	42.5	9.5 (+)
Marine Services.....	49.4	40.0	9.4 (+)
Railway and Steamship Services.....	27.3	23.8	3.5 (+)
Miscellaneous Services.....	—	.1	.1 (-)
	129.1	106.4	22.7 (+)
TOTAL DEPARTMENTAL EXPENDITURES.....	557.0	503.9	53.1 (+)
<i>Revenues</i>			
Air Services.....	32.0	29.3	2.7 (+)
Marine Services.....	7.6	6.5	1.1 (+)
Railway and Steamship Services.....	.5	.5	—
Miscellaneous Services.....	13.9	9.6	4.3 (+)
TOTAL DEPARTMENTAL REVENUES.....	54.0	45.9	8.1 (+)

EXPLANATION OF INCREASES AND DECREASES

Administration, Operation and Maintenance Expenditures

Departmental Administration—Expenditures increased \$1.2 million over the previous year. A large part of this was due to increased pay and retroactive payments made as a result of the new classification and pay system put into effect in preparation for collective bargaining. The number of staff also increased. Additional expenditures were made on transportation studies.

Air Services—Expenditure increase amounted to more than 12% and was mainly attributable to increases in salaries and personnel. Amounts required for professional and special services were greater and there were increased costs for the operation of airports under contract. The Airports and Field Operations Branch, the Air Traffic Control Division and the Meteorological Branch each had increases of over two million dollars.

Marine Services—Expanding operations and rising costs increased the expenditures of the Marine Operations Branch by \$4.5 million. Salaries, overtime, fuel and repairs to vessels all contributed to this increase. Marine Hydraulics Branch expenditures increased by \$0.4 million. In the latter Branch greater costs were incurred for professional and special services covering investigations and removal of wrecks.

Railway and Steamship Services—The Canadian National Railways deficit payment again declined. This year the reduction was \$8.8 million. The subsidy for the construction of the railway to Great Slave Lake was reduced by \$8.3 million as the railway neared completion. Payments under the Maritime Freight Rates Act decreased by \$0.7 million. These decreases were partly offset by an increase of \$1.0 million in the payment of deficits and subsidies on ferry operations.

Miscellaneous Services—Increases were: \$28.2 million in the payments under the Freight Rates Reduction Act, \$2.9 million in the payments to the St. Lawrence Seaway Authority and \$1.0 million to the Railway Grade Crossing Fund. Payments by the Canadian Maritime Commission for the assistance of shipping decreased by \$3.3 million and those to the C.P.R. and C.N.R. for the maintenance of trackage decreased by \$2.0 million.

Capital Expenditures

Departmental Administration—This is a new item and covers initial expenditures made for the acquisition of official railway cars as replacements for obsolete and worn out equipment.

Air Services—Investment expenditures of the Airports and Field Operations Branch were up by \$11.4 million. Major construction was underway on new Air Terminal buildings at Vancouver, B.C., and Sydney, N.S., and on an extension to

the terminal at Montreal. \$1.8 million was spent on the development of an airport at East Kootenay, B.C., and \$2.3 million for the purchase of an additional Lockheed Jetstar aircraft. Expenditures for the Telecommunications and Electronics Branch declined by \$2.3 million and those for the Meteorological Branch rose by \$0.6 million.

Marine Services—All programmes in Marine Services contributed to the increase of \$9.4 million. In Aids to Navigation major reconstruction and \$1.7 million was expended for a wharf at Sydney, N.S. There were increased expenditures of \$1.2 million for dredging in the St. Lawrence and Saguenay Rivers and \$2.7 million for construction of Canadian Coast Guard vessels. The Canals Division paid \$0.7 million to Quebec Hydro Electric Power Commission in settlement of a claim re the Carillon Power Development. Steamship Inspection expenditures increased due to \$1.1 million spent on a marine haul-out at Marys-town, Nfld.

Railway and Steamship Services—Expenditures on dock and terminal facilities at North Sydney, N.S., Argentia, Nfld., and Port aux Basques, Nfld., increased to \$11.0 million over \$6.7 million for the previous year. Construction of ferry vessels declined \$1.8 million.

Miscellaneous Services—The capital expenditure for canals entrusted to the St. Lawrence Seaway was \$23,000 compared with \$10,000 for the previous year.

Revenues

Air Services—Revenues of the Airports and Field Operations Branch increased by \$2.5 million attributable to increases in revenue from aircraft landing fees and airport concession fees. Revenues of the Telecommunications and Electronics Branch increased by \$0.4 million mainly due to increases in licences for T.V. stations.

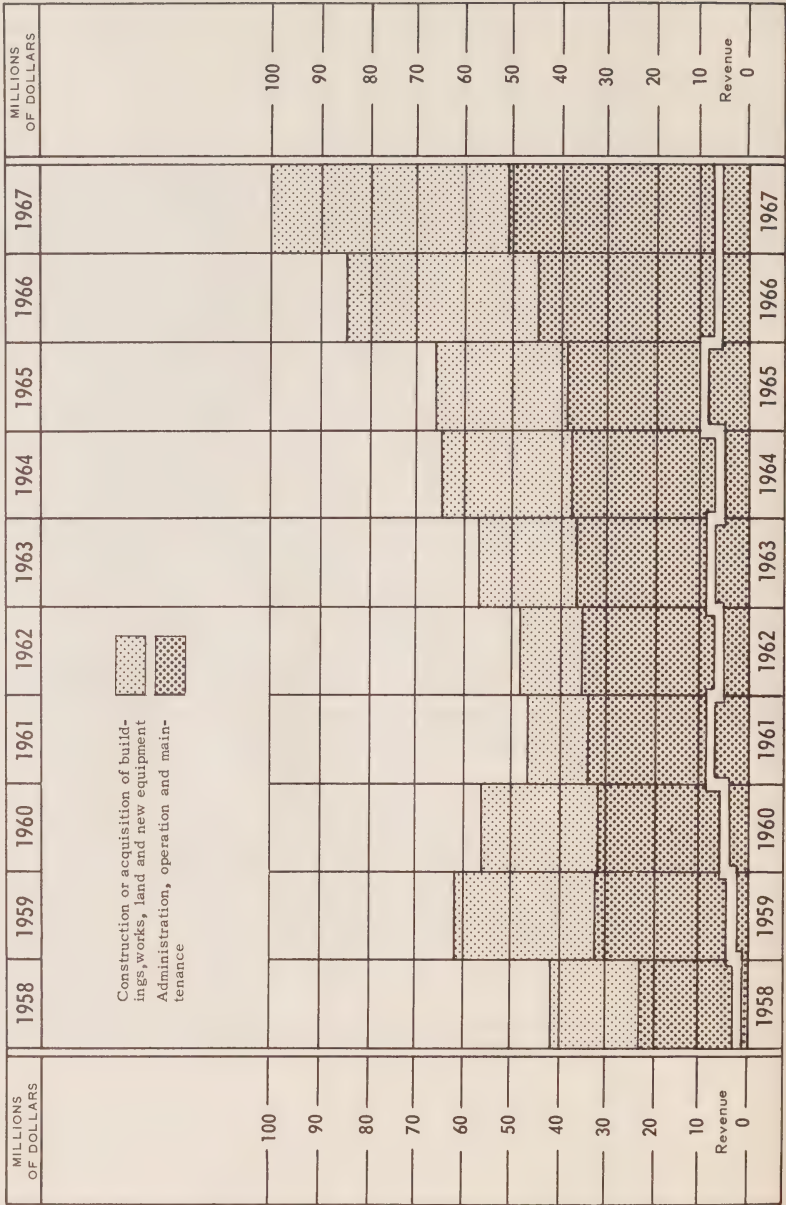
Marine Services—There was a new revenue item for the charter of the C.C.G.S. "John Cabot" to the Canadian Overseas Telecommunication Corporation for cable laying and repair purposes. Amount collected was \$1.3 million of which \$0.6 million was applicable to the fiscal year 1965-66. Earnings of the Canadian Coast Guard arising from northern supply operations declined to \$2.1 million compared with \$2.3 million for the previous year.

Miscellaneous Services—Interest payments by the St. Lawrence Seaway Authority, which were \$9.4 million for 1965-66, increased to \$13.8 million in 1966-67.

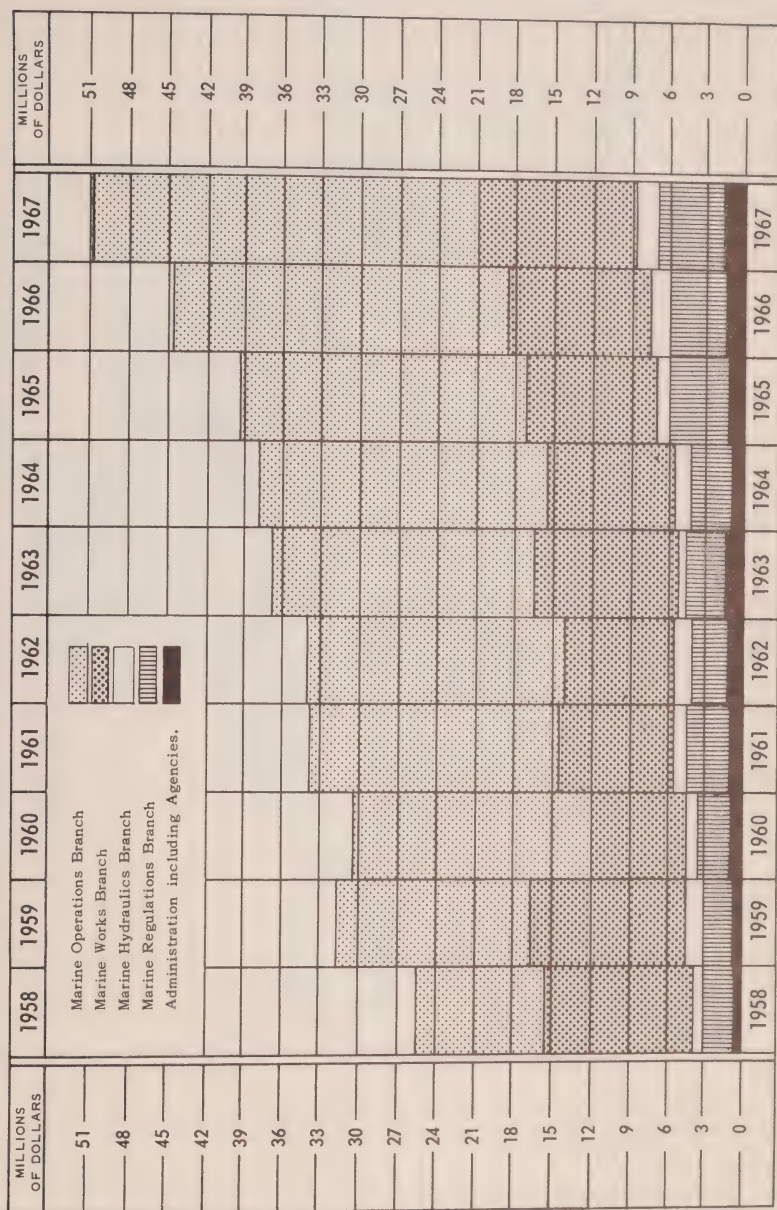
DEPARTMENT OF TRANSPORT

MARINE SERVICES

EXPENDITURES AND REVENUES FOR THE FISCAL YEARS 1957-58 TO 1966-67 INCLUSIVE



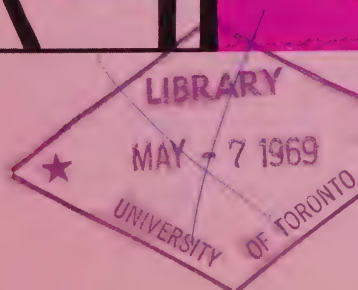
DEPARTMENT OF TRANSPORT

MARINE SERVICES-ADMINISTRATION OPERATION AND MAINTENANCE EXPENDITURES
FOR THE FISCAL YEARS 1957-58 TO 1966-67 INCLUSIVE

ANNUAL

1967-68

REPORT



DEPARTMENT OF TRANSPORT
CANADA



DEPARTMENT OF TRANSPORT

ANNUAL REPORT

FOR THE FISCAL YEAR ENDED

MARCH 31

1968

Submitted Under the Provisions of the
DEPARTMENT OF TRANSPORT ACT



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*To His Excellency the Right Honourable Roland Michener, P.C., Q.C., Governor
General and Commander-in-Chief of Canada*

MAY IT PLEASE YOUR EXCELLENCY:

The undersigned has the honour to present to Your Excellency the Annual Report of the Department of Transport for the fiscal year ended March 31, 1968.

PAUL T. HELLYER,
Minister of Transport

ACTS, AND BOARDS, COMMISSIONS AND CROWN-OWNED COMPANIES ADMINISTERED BY

MINISTER OF TRANSPORT

Boards, Commissions and Crown-Owned Companies

Air Canada
Canadian National Railway Company
Canadian Transport Commission
National Harbours Board
St. Lawrence Seaway Authority
Steamship Inspection Board
Central Mortgage and Housing Corporation

Acts

GENERAL

Bills of Lading Act
Department of Transport Act
Government Property Traffic Act
Transport Act
National Transportation Act
Motor Vehicle Transport Act
National Housing Act

North Fraser Harbour Commissioners Act
Port Alberni Harbour Commissioners Act
St. Lawrence Seaway Authority Act
Toronto Harbour Commissioners Act
Trenton Harbour Act
Water Carriage of Goods Act
Winnipeg and St. Boniface Harbour Commissioners Act

AIR SERVICES

Aeronautics Act
Carriage of Goods by Air Act
Foreign Aircraft Third Party Damage
Air Canada Act

RAILWAYS

Canadian National Railways Act
Canadian National-Canadian Pacific Act
Canadian National Montreal Terminals Act
Canadian National Railways Financing and Guarantee Act
Canadian National Railways Pensions Act
Canadian National Toronto Terminals Act
Government Railways Act
Intercolonial Railway and P.E.I. Railway Employees Provident Fund Act
Maritime Freight Rates Act
Railway Act (except telecommunications undertakings, facilities systems and service)

MARINE

Belleville Harbour Commissioners Act
Canada Shipping Act
Canadian National Steamships Act
Canadian Vessel Construction Assistance
Government Harbours and Piers Act
Government Vessels Discipline Act
Hamilton Harbour Commissioners Act
Harbour Commissions Act
Live Stock Shipping Act
National Harbours Board Act
Navigable Waters Protection Act

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Bouncy Boat-Buggy—Safety device used on Vancouver International Airport's swampy shore.

AIR SERVICES

Airports

Development—A detailed review of the consultants' recommendations for development of Montreal, Toronto, Winnipeg and Calgary International airports was undertaken to evaluate these proposals as part of the long-range planning program.

Suitable locations were selected for the proposed construction of landing strips at 26 remote northern settlements for the Department of Indian Affairs and Northern Development. Twenty-four sites have been evaluated, including completion of the topographic surveys, and runway design and engineering reports were completed for 10 of these sites. For an urgently needed landing strip at Coppermine, N.W.T., heavy construction equipment was ordered for delivery to the site during the 1968 shipping season.

Planning and Contracts—Projects were developed for the construction and strengthening of runways, taxiways, aprons, car parking facilities and roadways, and major contracts were awarded at Deer Lake and St. John's (Torbay), Nfld.; Moncton and St. Stephen, N.B.; Gaspé, P.Q.; Peterborough, Windsor, Elliot Lake, Toronto, and Fort William, Ont.; Winnipeg, Man.; Regina, Sask.; and Kelowna, Vancouver and Langley, B.C.

Contracts were completed for construction of infield facilities at Torbay; Moncton and Bathurst, N.B.; Bagotville, Cartierville and Drummondville, P.Q.; Windsor, Ont.; Regina; East Kootenay, Campbell River, Pitt Meadows and Vancouver, B.C.; and Yellowknife, N.W.T.

Master plans were completed for Torbay, Gander, Charlottetown, Saint John, Quebec, London and Windsor airports, and work is continuing in the preparation of commercial development and land use plans.

Engineering Design—Approximately 120 pavement designs were completed for the construction of runways, taxiways and associated airport facilities. The program for load testing, roughness and skid-resistance testing of pavements continued and approximately 180 pavement evaluations were completed during the year.

Soil conditions were evaluated and recommendations were made on foundation requirements for approximately 30 architectural and civil engineering projects, including the control tower at Calgary, bridge loading structures at Montreal International airport, and a hovercraft hangar at Vancouver.

Construction materials were tested to ensure compliance with contract specifications and studies were conducted to determine the suitability of various materials being used by the Department and to assess new products for use in the construction of Air Services facilities.

Power and Lighting—Projects undertaken included providing power services to nine terminal buildings, 23 general buildings, three VOR installations, and an Instrument Landing System (ILS).

Airfield lighting facilities were provided at 13 sites, and the first installation of a touchdown zone and centreline lighting was completed at Toronto International airport.

Emergency power units purchased totalled 35, and work proceeded on the further development of eight major electrical distribution systems and various items of new equipment for visual aids to navigation.

International Air Terminals—At Vancouver, construction of the new air terminal is proceeding on schedule, the utilities building has been completed, and tenders for the post office building were received.

Since the start of construction, three additional airlines and one charter airline have requested space within the terminal, which has necessitated revisions to the layouts to provide suitable accommodation.

The contract for two high-rise elevators at Toronto were completed, and studies for modification of the departure lobby, relocation of kiosks, provisions of additional ticket counter space, additional dining facilities and re-study of pre-clearance facilities were undertaken. Development of additional facilities at Toronto to provide for the introduction of the B747 and DC10 aircraft was under study in co-operation with other organizations, and consultants were appointed to assist in this work.

A requirement for similar facilities at Montreal, Vancouver, Calgary and Winnipeg is linked with the scheduled arrival of B747 capacity aircraft at these locations in 1971.

A new transborder finger extension at Montreal became operational prior to the opening of Expo 67. Studies were undertaken for further extensions to the additional ticket counters and in-transit lounge facilities.

Various studies for Winnipeg, related to bridge loading facilities and additional entrances to the domestic baggage claim areas were carried out and implemented. Contract documents for the addition of two escalators were completed and tenders were called.

Domestic Air Terminal Buildings—Contracts were completed or under construction for terminal buildings at Sydney, N.S., Bagotville and Val d'Or, P.Q., Terrace, B.C., and Katunayake, Ceylon (External Aid).

Working drawings, specifications and estimates were completed or are under way for control towers at Sault Ste. Marie and Pitt Meadows; extension to the terminal building at Torbay; a standard control tower for the terminal building at Montserrat, West Indies (External Aid); and extension to the Telecommunications wing at Toronto.

Preliminary sketches and cost estimates were completed or are in progress for terminal buildings at Prince George, Fort St. John, and Hay River; a terminal building and operation building at Yarmouth, N.S.; and extension to the Quebec terminal.

Projects completed or in progress included furniture for the Vancouver and Katunayake terminal buildings; development of graphic signs for terminal buildings; provision of art work for the Montreal and Vancouver terminals; publication of booklets on standard domestic terminal buildings; and preparation of a booklet on fine art in all departmental terminal buildings.

General and Special Buildings—Contracts completed or under construction included the satellite communications station number two at Mill Village, N.S., for Canadian Overseas Telecommunication Corporation; phase four of the Canadian Coast Guard College at Sydney, N.S.; Hay River marine agency; radar building extension and ASR3 at Carp; St. Lawrence Ship Channel building at Cornwall; maintenance garage and firehall at Fort St. John; and a hovercraft hangar at Vancouver.

Working drawings, specifications and estimates were in progress for Sept-Îles maintenance garage; Seaway pilot building at Montreal (St. Lambert); a firehall at Sault Ste. Marie and Vancouver; maintenance garage and firehall at Watson Lake; and a Telecommunications and Electronics building at Carp.

A study and sketch proposal was prepared for the proposed new headquarters building for the Montreal Region, and sketches were further developed for the Rideau Canal headquarters building at Smiths Falls, the Trent Canal headquarters building at Peterborough, and the Air Services Training School at Ottawa.

Administration—The growth of airports and their associated facilities and services during the fiscal year is reflected in increased levels of expenditure and revenues. During the year, expenditures increased by \$1,557,686 to \$33,500,000, and revenue by \$6,431,629 to \$32,800,000.

These increases were, in part, the result of the department assuming the responsibility for operating the airports at Stephenville, Goose Bay, House Harbour, and Calgary, and commissioning new terminal facilities at Sydney, Moncton, Bagotville and Montreal airports.

Requests for grants to municipalities for providing airport ground facilities and operating subsidies also increased. During the year, operating subsidies were approved and paid for the municipal airports at Trenton, N.S.; Saint John, Restigouche, and Charlo, N.B.; Rouyn, Rivière du Loup, Rivière au Tonnerre, Gaspé, and Mingan, P.Q.; Dauphin, Brandon and Lynn Lake, Man.; Beaverlodge and Prince Albert, Sask.; Peace River, Alta.; and Dawson Creek, Campbell River, Castlegar, and Kelowna, B.C.

Operation and Maintenance—An expenditure of \$25,000 was approved for professional services to identify conditions that attract hazardous bird species to airports and to recommend means of reducing bird hazards at specific airports.

Considerable field work was done to remove or reduce attractiveness of identified conditions on the airports and to enlist the co-operation of municipalities in the surrounding areas. Bird dispersal patrols are in effect at many airports.

Fire Losses—Fire losses in Air Services amounted to \$24,377.41, compared with \$8,020.44 last year which was an all-time low.

Fire Prevention Competition—The Canadian Coast Guard College, Sydney, N.S., won the Howard Green Trophy for competition in fire prevention activities between multi-building complexes of federal government civil departments and agencies. Honourable mentions were awarded to Edmonton International airport and the meteorological station at Big Trout Lake, Ont.

Crash Rescue Equipment—Five new crash rescue trucks were accepted for delivery to Halifax, Montreal, Toronto, Edmonton, and Vancouver International airports.

The first tracked amphibious vehicle was delivered to the Airport Emergency Service at Vancouver International airport for use in the tidal flats.

Maintenance—The first all-out use of urea to prevent or disperse ice on aircraft manoeuvring surfaces at mainline airports was made during the winter. Urea, a non-corrosive chemical, reduces the use of sand normally used to improve braking action on icy runways. The success in its use is a long step toward the ultimate objective of aircraft operators when sand can be eliminated. A saving of many hundreds of thousands of dollars caused by sand ingestion and impingement damage can be achieved, as well as providing a safer runway during winter conditions.

The installation of centre-line lighting at Toronto International airport created new problems for the snow removal crews, and considerable experience was gained in solving them. Snowplows with rubber blades and runway sweepers did a reasonably good job of clearing snow and ice. Urea was used to combat ice formation on the pavement around the fixture, proving of inestimable value.

An important contribution was made to ICAO last year by the development of a comprehensive report for use by an ICAO study group assigned to review and up date ICAO's aerodrome manual dealing with the removal of snow, ice, slush, water and other contaminants from aircraft manoeuvring surfaces. This paper detailed the latest methods, techniques and equipment used for this phase of airport operations. It has been adopted and will be used to amend the current ICAO publication.

Noise Abatement—As a result of meetings with the airline operators, late night operations at Montreal have been substantially reduced. Revised noise abatement procedures have been developed for both Montreal and Toronto International airports, and semi-automatic noise measuring stations installed in the approaches to three runways at Montreal are providing useful information.

Licences—At the end of the fiscal year there were 761 airport licences in force compared with 721 the previous year, 376 of which were land airports and 385 were water. Of these, 90 land and five water were Department airports.

Airways and Air Routes

On March 31 there were 33,750 nautical miles of designated low altitude airways, 8,529 nautical miles of low altitude air routes, and 29,313 nautical miles of high altitude airways.

During the year the following navigation and landing aids were in operation, last years figures being shown in brackets: NDB's of all types, 305 (301); VOR and VORTAC, 52 (48); ILS (includes three without GP), 47 (47); Precision Approach Radar, 8 (7); Airport and Airway Surveillance Radar, 17 (16); LF/MF radio ranges, 47 (56). The reduction in the number of LF/MF radio ranges is in keeping with the Department's policy of replacing the radio range with more modern enroute aids and terminal facilities.

During the year the following visual aids were installed: three low intensity approach light systems; one high intensity approach light system; three medium intensity runway light systems; two high intensity runway light systems; 11 visual approach slope indicator systems; three runway identification light systems; one centreline and touchdown zone light system; and two hazard beacons.

Airmen Licences

At the end of the fiscal year, there were 33,737 airmen licences in force, compared with 28,886 last year. These were classified as follows, with 1966-67 figures in brackets: Pilots—glider, 1,307 (926), private, 21,347 (18,484), commercial, 4,431 (3,605), senior commercial, 518 (412), airline transport, 2,262 (1,817); flight navigator, 186 (175); air traffic controller, 878 (811); flight engineer, 106 (65); and aircraft maintenance engineer, 2,702 (2,591). In addition there were 2,435 Class I and 502 Class II instrument ratings, compared with 1,931 and 318 respectively the previous year.

The requirements for alternate aeroplane/helicopter category endorsements on commercial and higher class licences have been prepared for distribution early in the next fiscal year and detailed requirements for the issue of helicopter category senior commercial and airline transport pilot licences are under preparation.

An agreement with Australia was concluded with regard to the interchangeability of flight crew licences.

Since its inception early in 1966, the civil aviation medical advisory panel has received 122 applications for review of physical fitness to hold pilot or other flight crew licences. Applications during the year totalled 37.

Aircraft Licensing

Civil aircraft registered at the end of the fiscal year totalled 9,296 compared with 8,454 last year.

Flying Training

From the 40 flying clubs and 122 flying schools, 5,470 private and 1,400 commercial pilots were graduated, compared with 3,915 and 1,192 respectively the previous year. Of the 1,232 flying instructors, 1,014 instructed in aeroplanes, 71 in helicopters, and 147 in gliders.

Examinations

Examinations of pilots, engineers, and other personnel totalled 14,480 compared with 14,949 during 1966-67.

Air Regulations Infractions

For infractions of air regulations there were 126 prosecutions, 57 licences were suspended, and 147 letters of warning were issued, compared with 67, 20 and 155 respectively for the previous year.

Air Carriers

On March 31, there were 792 commercial air carriers operating the various types of commercial air services in Canada, and holding one or more valid operating certificates. Of this number, 437 were Canadian air carriers and 355 were foreign and Commonwealth.

Aircraft Accidents

During the calendar year 1967, 512 accidents were investigated, 471 of which involved Canadian registered aircraft and 41 foreign. A total of 218 fatalities and 113 serious injuries resulted from these accidents. Accidents increased by 11 per cent from the previous year, fatalities increased by 15.9 per cent and serious injuries by 31.1 per cent.

During the fiscal year 1967-68, a major investigation was carried out on three accidents involving transport turbine powered aircraft: a DC8 at Ottawa on May 20, 1967; an Ilyushin 18 at Gander on September 5, 1967; and a Boeing 707 at Vancouver on February 7, 1968.

Air Traffic Control

During the fiscal year, 40 control tower facilities were in operation, an increase of four over the previous year. New towers were commissioned at St. Jean, P.Q.; Kamloops and Pitt Meadows, B.C.; and Resolute Bay, N.W.T. The facility at St. Jean was commissioned to cope with increased traffic during Expo 67 and was decommissioned on October 31, 1967. The Resolute Bay tower is on summer-months-only operation. Additional control towers are expected to be commissioned at Wabush, P.Q.; Hamilton, Sault Ste. Marie, Waterloo/Wellington, Oshawa and Kenora, Ont.; and Brandon, Man. The Kenora tower will be on summer operation only.

Aircraft movements at departmental controlled airports totalled 4,044,163, an increase of 21.9 per cent over the previous year. Of this total, airline operations accounted for 487,406 itinerant movements, and other civil operators accounted for 1,067,700 itinerant movements. Local training and military itinerant flights made up the remainder.

At the beginning of the fiscal year there were eight area control centres in operation. On March 28, 1968, the area control centre at Goose Bay, Labrador, was decommissioned and became a remote sector of the Moncton area control centre. Area control centres handled 941,326 IFR (Instrument Flight Rules) flights during the fiscal year, an increase of 18.8 per cent over the previous year.

Further improvement in air traffic radar control has resulted from the operational use of high-definition radars (ASR-5) at Montreal, Toronto, Winnipeg, Calgary and Vancouver. ASR-5's are currently being installed at Ottawa and Halifax. Plans are under way to expand secondary surveillance radar—now provided at fifteen sites—from a 64 code to a 4,096 code capability, beginning in the spring of 1969.

A data processing system to assist in the control of trans-Atlantic traffic was commissioned on March 16, 1968, at the Gander area control centre. This is the first of a number of proposed computer systems to be introduced into the Canadian air traffic control service. Introduction of an interim computer system for the Toronto area control centre is now in the initial stages of procurement and should be operational in the 1969-70 fiscal year. Development of a more advanced installation is being carried out simultaneously.

Flight Services

The departmental fleet of aircraft consists of 45 fixed-wing and 27 helicopters. Five JetRanger helicopters were added to the fleet during the year, two of which are operated on behalf of the Department of Energy, Mines and Resources.

New helicopter sub-bases have been attached to the Marine Agencies at Saint John, Charlottetown, Quebec and Sorel.

Each of the six Air Services Regions is equipped with a Beechcraft Model A90 KingAir aircraft fitted out for the calibration of radio aids to navigation. Ottawa headquarters operates a transportation version of this aircraft for V.I.P. flights.

During the year the replacement program was completed for light twin-engined aircraft and a Beech B55 Baron has been allocated to each Region. A turbo-supercharged version went to Vancouver where the higher performance is necessary because of mountain flying requirements. One Baron is also used at Ottawa for transportation and pilot proficiency training.

Evaluation is in progress for a Beech 18 replacement whereby the Regional aircraft will be replaced by a medium twin in a program extending over a three-year period.

During the year under review, the fixed-wing fleet flew a total of 19,105 hours, an increase of 10 per cent over last year. The helicopter fleet flew a total of 7,898 hours, an increase of 25 per cent. The helicopter fleet is now operational throughout the year, with new commitments being continually added.

Extensive pilot training was undertaken during the year and limited JetStar flying has been given to 11 Regional check flight inspectors. The executive pilot staff gave proficiency training, flight simulator training and ground school courses. Four executive pilots were trained to captain status on the Viscount and seven to first officer status.

Each executive pilot is required to take eight hours of flight simulator training a year on the Viscount with Air Canada in Montreal. In addition, the

pilots qualified on the JetStar are required to take 10 hours of flight simulator flying and 24 hours of ground school a year with Flight Safety Incorporated of New York.

Mechanic ground school courses have been continuous on the JetRanger, Alouette, KingAir, Baron, JetStar and Viscount for both the base mechanics and those from the Regions and airworthiness inspection. During the year 112 Ottawa based and Regional mechanics took these courses.

Plans and specifications were prepared for extensive modification to the older JetStar for installation of and modification to almost the entire avionics package. This will standardize this aircraft to the same configuration as the new JetStar and Viscount aircraft.

The entire avionics workshop and the aviation avionics engineering section have been transferred to the Flight Services Division. This new section will plan, draw up specifications and obtain aeronautical engineering approval for all avionic requirements as well as maintain complete maintenance support for the departmental fleet.

Aeronautical Engineering

During the year, in which Canada's Centennial celebrations were marked in almost every phase of her activity, the first flights of two new aeroplanes of Canadian design and construction were observed by representatives of the Aeronautical Engineering Division. Two others, also of Canadian design and construction, were granted type approval. In addition, type approvals were granted for five foreign aeroplanes, three gliders, one helicopter, and for another variant of the very successful Canadian turbine aero-engine.

Flight Data Recorders—Flight data and cockpit voice-recorder installations in Canadian air carrier aircraft have progressed to the extent that major carriers have decided on their sources of supply, and legislation appropriate to the installation of recorders is now being promulgated.

Airworthiness Co-operation—Officers of the Division went to the United Kingdom to discuss the details of a technical agreement on airworthiness co-operation which has been under negotiation since 1965. Rome was also visited to explore the possibility of arriving at a similar technical understanding whereby officers of the Registro Aeronautico Italiano would validate Canadian certificates of airworthiness for its exported aircraft on a reciprocal basis.

Control of Airworthiness—The control of airworthiness is under review in a number of areas, including inspection and engineering policies, comparing and up-dating airworthiness requirements, the approval of companies, standards of workmanship—especially in aircraft maintenance—and a survey of the requirements relating to the private aircraft owner and the upkeep of his aircraft. Safety in flight cannot be over emphasized and it is becoming increasingly apparent that the control of airworthiness must be broader based as aviation activity increases.

Safety Consideration of Aviation Fuel and Its Handling—The two-year study of aviation fuel management methods has been completed and a draft of the final report has been prepared.

Home-Made Centennial Balloons—Airworthiness requirements for home-built aircraft were extended to include home-built manned free balloons, a popular project during the Canadian centennial year.

Planning, Research and Development

During the year 16 research studies were completed on such subjects as noise measurement units, Toronto motor vehicle requirements, and the capacities of eight Canadian airports. A survey of general aviation in the Vancouver area was carried out during the summer and the observations were incorporated in the master plan for Vancouver International airport.

Work was begun or continued on 10 long-term major studies covering a number of subjects. For example, by using computer techniques, preparation is under way to simulate the operation of aircraft on the runways of an airport. This simulation will be used to examine problems associated with runway capacity, but it is hoped that the model and technique can be extended to examine the problems associated with terminal area airspace. Other subjects of the long-range studies include bird hazards to aircraft in flight, air cargo systems, aircraft noise, sonic boom, and civil supersonic transport aircraft operations.

Research was continued throughout the year in support of the Canadian contribution to the North Atlantic Systems Planning Group. At the request of the chairman of the Canadian delegation, arrangements were made to have a specially equipped T-33 aircraft of the National Aeronautical Establishment investigate the size and strength of the wing-tip vortices produced by large commercial jet aircraft during cruising flight. Data from these flights was required to establish the limits of an important factor in the "collision risk equation".

Aviation systems planning activities included development of a "Scope of Work" document on which the contracts with aviation consultants for master plan studies on Montreal, Toronto, Winnipeg and Calgary International airports were based.

Economic and operational 20-year forecasts were compiled for 25 major Canadian airports and consolidated into a booklet, which will be ready for distribution shortly. A companion booklet on operational characteristics of new aircraft is nearing completion and will be issued soon for use as a planning guide.

Master plan drawings for Halifax, Montreal, Ottawa, Winnipeg, Edmonton, Vancouver and Victoria international airports were updated, and new drawings for Quebec and London airports were issued.

Aviation systems analysis studies were carried out on 19 airports in 1967. Reports on the studies for Moncton, Fredericton, Baie Comeau, Toronto, Lakehead, The Pas and Saskatoon have been published. Those for Gander, Yellowknife, Whitehorse, Charlottetown and Edmonton international are in preparation. Data for the remaining airports have been collected and reduced for record purposes.

The Department was represented at meetings of standing committees concerned with all-weather operations, supersonic aircraft operations, aviation systems planning, and airlines-DOT co-ordination.

Telecommunications

Telecommunication activity within the Department has been reorganized with the formation of a Government Telecommunications Policy and Administration Bureau in accordance with recommendations of the Glassco Commission.

The Bureau will develop, co-ordinate and recommend, for appropriate ministerial or government consideration, broad telecommunications plans and policies, both national and international, which take cognizance of the public interest and enhance the orderly development of telecommunications in Canada. It will also keep under review and make recommendations on the government's use of telecommunications and, in particular, it will plan and manage the administrative telecommunications services for federal departments and agencies.

In addition, it will incorporate, on a continuing basis, administration of telecommunication legislation such as the Radio Act and Regulations including allocation and assignment of radio frequencies, radio provisions of the Canada Shipping Act, Ship Station Radio Regulations, the Telegraph Act and the Regulations thereunder covering the licensing of overseas submarine cables.

The Telecommunications and Electronics Branch will continue to be responsible for research into and development of new and improved communication and electronic equipment and systems in support of aeronautical, marine, meteorological and other services; construction, maintenance and operation of radio aids to marine and air navigation and of radio communication stations, including procurement of the necessary equipment; and administration of the leasing of landline telecommunication circuits, equipment, and related facilities for all services of the Department.

Radio Regulations

Licensing—The number of radio station licences in force at the end of the fiscal year was 219,590 compared with 191,849 the previous year. These include stations operated by departments of federal, provincial and municipal governments (excluding the Department of National Defence), publicly-owned and privately-owned point-to-point and land mobile stations, stations on ships and aircraft registered in Canada, General Radio Service, Tourist Radio Service and amateur stations, but does not include private commercial broadcasting licences.

Safety Radio Surveys, Inspections and Suppression of Interference—Radio Regulations inspectors, operating from 33 field offices throughout Canada, conducted 2,654 ship station radio surveys and 15,251 inspections of various classes to ensure compliance with Canadian laws and international conventions and treaties.

Interference complaints totalled 21,149 and 17,218 were completed, compared with 15,522 and 13,280 respectively the previous year.

There were two investigations of breaches of the Radio and Canada Shipping Acts and seven court actions resulting from previous investigations.

Infringement notices were issued covering a total of 8,567 infractions detected at monitoring stations. Of these, 4,571 were domestic and 3,996 were foreign. Frequency measurements totalled 92,940 and 945 spectrum graphs were made for frequency selection purposes. Tape recordings of station broadcasts totalling 97,300 feet were prepared for the Canadian Radio-Television Commission.

Frequency and Call Sign Assignments—Frequencies assigned, amended or deleted totalled 31,789 compared with 19,315 the previous year. A total of 2,670 proposed frequency assignments were referred to foreign administrations for co-ordination, and foreign administrations referred 1,750 proposed assignments to Canada. The combined frequency co-ordination total for the previous year was

3,762. Call signs assigned, amended or deleted totalled 10,089 compared with 8,560 for the previous year. A total of 81 interstation interference cases were processed.

Examinations and Certificates of Proficiency in Radio—During the year, 6,478 examinations were conducted compared with 7,166 for the previous year, and 7,876 certificates were issued compared with 7,445 the previous year. As of March 31, the total number of certificates issued was 102,935.

Broadcasting—Applications processed for licences to establish amplitude and frequency modulated private commercial broadcasting stations (sound) and for changes of facilities in existing stations totalled 174.

A total of 134 applications for private commercial broadcasting stations (television) and for changes of facilities in existing stations were dealt with, and 387 for land stations performing a commercial broadcasting receiving service (CATV).

Applications for stations performing an auxiliary service to broadcasting totalled 145 and there were 254 applications for transfer of stock, change in ownership or change in name of licensee.

A total of 271 private commercial broadcasting stations (sound and television) either commenced operation or modified their facilities pursuant to the Minister's licence authority.

As a result of these applications, 95 notifications were distributed to signatory countries of the North American Regional Broadcasting Agreement. Notifications from signatory countries totalling 1,754 were scrutinized to ensure Canadian stations were being protected in accordance with the Agreement. Similar notifications concerning eight television and 15 frequency modulated stations were forwarded to the Federal Communications Commission.

Radio Equipment Standards, Approval and Interference—With the use of radio becoming increasingly extensive in Canada, minimum standards for a greater variety of equipment have to be laid down to ensure maximum and orderly use of the radio spectrum. These standards or specifications provide a major control to achieve that end. With the close co-operation of the Canadian Radio Technical Planning Board (CRTPB), an industrial advisory organization, four new issues of detailed equipment specifications, including one on the transmitters used in stereophonic FM broadcasting, were promulgated by the Department.

In addition, six more are in various stages of completion, including two for maritime mobile equipment adapted to the recent changes in the International Telecommunications Union (ITU) Radio Regulations resulting from the World Administrative Radio Conference held in Geneva in 1967. Radio Standards Procedure 103, an important document concerning the approval of radio equipment in general, has recently been revised and passed to the CRTPB for review.

Manufacturers made a total of 267 requests for type-approval of radio equipment during the year. The Department's Radio Regulations Laboratory collected \$12,000.00 in fees for undertaking type-approval test on 37 of these units. There were 14 exemptions from licensing granted during the year and six industrial, scientific, or medical equipments approved under government standards.

In consultation with the Electronic Industries Association, the section of the Radio Act containing limits for radio noise from television receivers was amended

to grant Canadian manufacturers an additional four years to reduce the conducted radio noise produced by television receivers from the present 100 microvolts to 40 and a technical circular covering the method of measurement was issued.

Participation continued throughout the year in the work of the Canadian National Committee on the International Electrotechnical Commission developing international standards for radio equipment. During the year, 38 International Electrotechnical Commission documents from the secretarial and central office were reviewed and comments sent to the chairman of the sub-committee. The Department was represented at meetings of the Radio Technical Commission for Aeronautics at Los Angeles and Washington, concerned with environmental standards and performance characteristics of aircraft radio equipment. As a member of the Canadian National Committee of the International Electrotechnical Commission (CN/IEC) and chairman of the CNC/IEC International Special Committee on Radio Interference (CISPR), the Department's representative attended a joint meeting of the CNC/IEC and subcommittee chairman in Toronto, May 8, 1967, where international standards for world trade were discussed. During the year several IEC documents on CISPR from the CNC/IEC secretary were voted on, and comments sent to the secretary, as Canada's contribution to international standards for the control of radio interference.

Allocations and Allotment Standards—Telecommunications officers provided advice to the Department of Justice on amendments to the Radio Act in connection with the preparation of a new Broadcasting Act. The Radio Act amendments also contained features designed to strengthen the authority of the Governor-in-Council and the Minister in dealing with outer space satellite radio stations, international telecommunications negotiations, research in the field of radio, and generally to prescribe measures designed to assume the orderly development of radiocommunications in the public interest. The amendments to the Act become law effective April 1, 1968.

With the co-operation of the Canadian Radio Technical Planning Board (CRTPB), Standard Radio Systems Plans (SRSP) pertaining to the technical requirements for radio-relay systems operating in the lower and upper 2GHz band have been issued and are now in effect. A draft SRSP covering the usage of the 7GHz band was released for CRTPB comments. This, together with revisions to the existing SRSP for the 4GHz band, will be issued shortly in final form. Issue 2 of the guideline for the upper 6GHz band, as well as a new guideline for the 8275-8400 MHz band, have been prepared to assist with the planning and subsequent development of SRSP's for these bands. Radio Standards Procedure 101 pertaining to the data required with applications for single or multiple-hop radio links operating in the band between 30 MHz and 40000 MHz has been released in final form.

Engineering briefs in support of applications for the establishment of new microwave systems or the expansion of existing systems totalled 164, which has more than doubled in the past two years. This has been due primarily to a large number of new systems in the 2GHz band and increase in microwave systems for conveying television. Co-ordination of radio frequencies to be used at two communication satellite system earth stations, one in Canada and the other in the United States, was carried out to ensure that they would not interfere with Canadian radio-relay stations. The mobile laboratory was employed for a period

of eight weeks on special field projects to determine the spectrum signals of radars used for navigation and surveillance. This information is necessary to ensure that radar systems do not cause interference to other Canadian microwave systems.

National Telecommunications Planning—The consultant study of the potential use of satellite communications systems for domestic purposes in Canada was completed by the Northern Electric Company under contract to the Department. This comprehensive study provided valuable information such as traffic requirements, system configurations, inter-relation and inter-connection with ground communications and costs. This information was used in support of the activities of the task force on satellites under the Science Secretariat leading to the issuing, in March 1968, of the Government's white paper on domestic satellite communication system for Canada. The Director of the Government Telecommunications Policy and Administration Bureau served as a member of the task force and a number of other personnel provided expert advice.

The Department is continuing with studies which will provide information and advice to the task force, including a cost-revenue study on the interaction of satellite and ground microwave systems. The Bureau is also providing support to an intra-departmental committee which is currently engaged in a study to assist the Government in its enquiry into the possibility of new national telecommunications legislation.

As a result of departmental negotiation and co-ordination, arrangements have been made to permit the Bell Telephone Company and Canadian National Telecommunications to carry out technical improvements to the United States Air Force owned Polevault South military communication system to provide eleven telephone circuits between the Island of Newfoundland and Goose Bay, Labrador. Extensive testing and circuit evaluation is currently under way to ensure that the additional channels will not in any way degrade the essential North American defence communications for which the system was originally constructed. The new circuits will be put into service in July, 1968.

Discussions are under way between the Department and Canadian National Telecommunications (CNT) to arrange for a 36 channel radio link between CNT's Alaska Highway microwave system and the newly opened mining area around Vangorda Creek about 120 miles east of Whitehorse, Y.T. The new system, to be built in the summer of 1968, will carry telephone, telegraph, and the CBC network to the existing settlement at Ross River and to the new town-site and mining companies at Vangorda Creek.

Government Administrative Telecommunications—The fiscal year under review was primarily one of continuing expansion at a rate that exceeded previous years.

The network consisting of Montreal, Ottawa, and Toronto was enlarged to include Quebec City and Hamilton. In addition, network facilities in the form of a Telpak were extended to Winnipeg to replace the Wide Area Telephone (WATS) service, effecting a reduction in the cost per call, and making provision for the increased demand for communications between Ottawa and Winnipeg.

Network facilities were expanded in all existing cross sections by larger sized Telpaks.

These common user inter-city services handled approximately 12,000 calls per average day, an increase of 50 per cent over the previous year at an increased cost of 25 per cent. The cost of handling the same calls by ordinary commercial long distance would have been some \$5 million more.

With increasing traffic loads, action was taken to improve the grade of service and reduce the operating costs. More dynamic traffic analysis resulted in a better determination of needs and, as a result, the number of locations that could be dialed without operator assistance from Ottawa was increased.

The General Shared Services Program, managed by the Treasury Board, includes the integration of communications in Canadian Government buildings, particularly those located outside the large centres which are consolidated on the network. The Department, in co-operation with the Treasury Board, recommended some 25 proposals for implementation as the first stage of this program became operational. In each case there were cost savings to the Canadian Government, as well as improved and co-ordinated answering service to the general public.

In addition to telephone service, a program of reviewing teletype machine installations resulted in some 40 machines being shared by departments, with resulting lower cost and increased efficiency.

Continuing study and liaison with the Department of National Defence resulted in an increased use of the Government's consolidated network to serve National Defence administrative needs when they could efficiently be shared with other departmental users.

The Public Service Commission was invited as a consultant to make a study of techniques that would best serve Government telephone directory requirements. Before the year was completed, several of the resulting recommendations were implemented, and the remainder programmed for the following year.

Staffing plans were implemented sufficiently to meet the basic administrative telecommunications requirements in each region. As a result, the full range of these services available to departments in Ottawa are now available in all regions as well. These skills were established to prepare for the consolidations planned during the subsequent years.

Communication companies supplying service to the Canadian Government via the Administrative Telecommunications Agency increased their staff and services to complement ATA plans.

Accommodating the growth consumed the largest part of activity during the year. The forecast for the next five years reflects a more modest increase of slightly over 30 per cent per year, and includes an increasing need for data communications, as well as for continued telephone expansion. As a result, a study was initiated in the last few months of the year to determine the message traffic requirements. The results of this study will include a recommendation for the use of consolidated facilities that will provide for the next phase of telecommunications growth.

Radio Communications and Aids to Navigation

Marine Communications—New installations were completed at Sydney, N.S.; Sept-Iles, Trois Rivières, Quebec City, and Inoucdjouac (Port Harrison), P.Q.; Kingston, Ont.; Coral Harbour, N.W.T.; and the station at Victoria was relocated to Sooke, B.C.

Fixed/Aeronautical Communications—New installations were completed at Lynn Lake, Man., and High Level, Alta. Existing installations at the following aeradio stations were renovated, Sydney, N.S.; Saint John, N.B.; Schefferville, Fort Chimo, Sept-Iles, and Quebec City, P.Q.; Ottawa, Ont.; Brandon, Man.; Fort Chipewyan, Alta.; Coppermine, N.W.T., and Teslin, Y.T.

A number of air traffic control towers and terminal control units have been installed or renovated at the following locations: Gander, Nfld.; Sydney, N.S.; Sept-Iles and Quebec City, P.Q.; Ottawa, Buttonville, and North Bay, Ont.; Brandon, Man.; and Calgary, Alta.

The installation of new communication control equipment was completed at the Gander area control centre, and facilities were provided for the extension of very high frequency (VHF) radio coverage of the Winnipeg area control centre via Churchill, and Moncton area control centre via Goose Bay, Labrador.

Equipment for air traffic control training has been installed at Gander and Vancouver.

To facilitate aeronautical and marine communications, new transmitter sites were established at Yarmouth, N.S.; Quebec City; Toronto Island and Gore Bay, Ont.; Fort Chipewyan and Peace River, Alta.; Coppermine, N.W.T.; and Mayo, Y.T.; new receiver sites were established at Sydney, N.S., and Norman Wells, N.W.T.

Ancillary Communications—A number of miscellaneous items, such as a cordless microphone system, a data map projector, and transcribed weather broadcast equipment, were installed at various locations across the country.

Very High Frequency Omni-Range (VOR) and TACAN Navigation Aids—VOR facilities were commissioned at Baie Comeau, Mont Joli, and Sept-Iles, P.Q., and North Bay, Ont.; and an installation at Stephenville, Nfld., was taken over from the United States Air Force. An External Aid sponsored project at Trinidad was also installed, flight checked, and completed.

VOR site selection work was started at Wabush and St. Anthony, Nfld.; Lambton, P.Q.; Le Pas, Man.; Grande Prairie, Alta.; Fort St. John and Fort Nelson, B.C.; and Whitehorse and Watson Lake, Y.T.

Instrument Landing Systems—Instrument Landing Systems (ILS) were commissioned at Yarmouth, N.S.; St. Hubert, P.Q.; Grande Prairie, Alta.; and Port Hardy, B.C. At Regina, Sask., a non-directional beacon back beam marker was commissioned and the glide path and middle marker were relocated.

Construction of new ILS installations at Halifax and Sydney, N.S., Sudbury, Ont., Churchill, Man., Fort McMurray, Alta., Cranbrook, B.C., and additions to the ILS at Montreal, P.Q., and Inuvik, N.W.T. are either nearing completion or under way.

New equipment was added to the ILS at Toronto and improvements are under way or planned for the facilities at Gander, Halifax, Montreal, Winnipeg, Calgary, Edmonton and Vancouver.

Low Frequency Navigation Aids—Marine radio beacons were established at Baccalieu Island and Cabot Island, Nfld., Peckfords Island, N.S., and Geroux Island and Killarney, Ont.

Aeronautical non-directional beacons were established at Baie Comeau, Gaspé, Manicouagan, and St. Foy, P.Q., Bonfield, Ont., Churchill, Man., and Alert Bay, Brilliant, Champion Creek, and Vancouver, B.C.

Radar—Airport surveillance radars (ASR-5) were installed at Montreal, Toronto, Calgary, and Vancouver, and are being installed at Halifax, N.S., and Ottawa and Carp, Ont.

Contracts were let for secondary high definition radar equipment and modification kits for existing secondary systems to increase the capability of control of air traffic of all airport surveillance radars.

A Precision Approach Radar (PAR) was installed at Calgary and a second one is being installed at Toronto. Equipment was added to existing systems to improve their sensitivity.

A contract was let for the supply of 40 video map generators for additions to existing and planned radar systems across Canada to produce special air traffic control maps on the radar displays.

Additional radar bright display equipment to convert the standard type PPI display to television type was installed at Gander, Moncton, Montreal, Ottawa, Toronto, Winnipeg, Calgary, Edmonton, Vancouver, and at the Air Services Training School at Carp, Ont.

Automatic balloon tracking radar and wind computing systems were installed on the two new weather ships, CCGS *Quadra* and CCGS *Vancouver*, and are now undergoing testing prior to final acceptance.

Aviation Electronics—An electronic equipment console was installed in a KingAir flight inspection aircraft, and electronic equipment on board one Jet-Star, one Turbo-Baron, and two Bell JetRanger helicopters was modernized and improved. Electronic systems on board all departmental Beaver aircraft were standardized, and communication and navigation equipment suitable for Hovercraft was investigated.

Marine Electronics—Extensive communication and navigation equipment was installed in eight new departmental vessels and two new CNR ferries. Engineering investigations and evaluations were carried out on three marine radars, a radar bright display projector, two types of radio transceivers, an antenna selection control panel, a radar data map printer, and miscellaneous additions and alterations were made to existing equipments.

Maintenance and Operations

Five ionospheric stations operated full time throughout the year. Special data was provided in support of the Alouette I satellite and several rocket projects. Command and telemetry recording of the Alouette I and II satellites continued at Resolute, N.W.T. A digitizer was purchased to eliminate data card punching and reduce data handling costs.

The Canadian teletype aeronautical fixed telecommunications network increased by approximately 10 per cent and now consists of 29,000 circuit miles with a staff of 123 communicators delivering 30,000 messages daily. A task force has been formed to study the feasibility of upgrading the existing manual/semi-automatic mode of operation to a centralized computer based switching system.

Ship-shore communications were improved in the vicinity of Bay de Chaleur, P.Q., and Miramichi Bay, N.B., by the remote control of a transmitting and receiving facility at Bonaventure, P.Q., from Fox River, P.Q.; in the western end of Lake Ontario, eastern end of Lake Erie, and Welland Canal by the remote control of VHF facilities at Fonthill, Ont., from Toronto; in the Hudson Bay area by a

message and telephone service on VHF at Churchill, Man.; and in the Juan de Fuca Strait by relocating the Victoria Marine Radio station to Sooke, B.C., and the addition of MF/VHF marine telephone service and a VHF message and broadcast service.

Agreement was reached with Trans-Canada Telephones for implementation of a zone rate system for use on the Canadian "High-Seas" Marine Telephone Service through departmental stations at Halifax and Vancouver. A booklet advertising this service has been distributed to shipping firms and other organizations.

To improve broadcast coverage of weather and dangers to navigation information on the Great Lakes, departmental stations at Wiarton, Sault Ste. Marie, and the Lakehead, Ont., commenced broadcasting this information on HF at 4 MHz.

To improve facsimile and plain language ice information during Arctic resupply operations, low frequency (LF) facsimile transmissions were provided on a trial basis. Ice facsimile broadcasts were also added to the existing Edmonton facsimile transmissions, and ice information was added to the Frobisher station plain language broadcasts.

Negotiations were conducted whereby the Department would assume maintenance of the radio systems used at National Parks located in the Maritimes, to be effective April 1, 1968.

Planning and co-ordination were carried out for the projected take-over from the Canadian Armed Forces of the Commonwealth Communications System by the Department's station at Vancouver, effective September 1, 1968.

The Facility Availability and Equipment Failure Reporting System has processed and stored about one quarter million records on departmental electronic systems over a two-year period beginning in early 1966. In addition to the widely distributed scheduled performance reports, a program has been developed to extract data rapidly to assist in studies related to electronic equipment performance problem areas. A program has also been developed to provide a situation report on air traffic control communications frequencies at airports.

As of March 31, 1968, air-ground facilities were provided by 120 aeradio stations and the Department was operating 48 LF/MF ranges, 253 aeronautical radio beacons, 52 VHF omni-directional ranges, 32 TACANs, 47 instrument landing systems, 35 PAL circuits, and 51 radar systems (primary, secondary, terminal precision, and weather types).

Over 7,000 pages of technical instructions have been printed in addition to other publications such as the National Availability Report, High-Seas Telephone Booklet, Marine Radio Communications Booklet, and Radio Operator Career Booklet.

Training

Approximately 360 technicians attended courses at the Air Services Training School, Ottawa. Forty-four courses were presented on the maintenance of approximately 25 different equipments in the field of radar, communications, and navigational aids. In addition, approximately 130 electronic technicians attended equipment courses presented by the Meteorological Branch, the Department of National Defence, and equipment manufacturers.

An additional course for radio operators was started during the year at the Training School, bringing the number of parallel 32-week courses to four.

From these courses, 103 radio operators were graduated, 82 of whom were high school graduates with no previous radio operator experience.

Research and Development

Space Systems—At the experimental earth station at Mill Village, N.S., test data and system records were evaluated and the information applied to the writing and production of a comprehensive manual for the station, which since 1966 has been operated by the Canadian Overseas Telecommunication Corporation. A multiplex system was installed and tested to facilitate participation in experiments with the National Aeronautics and Space Administration (NASA) designed application technology satellite.

Analysis of radio frequency propagation characteristics over sea water and land was carried out, together with a systems feasibility study for CAFIS (Communications System for Canadian Atlantic Fisheries Information Service). A report was submitted to the interdepartmental committee.

Computing Systems—The Gander automated air traffic system (GAATS) went into operation in January 1968. Developed in co-operation with the Civil Aviation Branch, the system provides assistance to air traffic controllers by performing certain tasks automatically. It also provides improved usage of oceanic air space through the ability of the computer to perform extensive calculations on the flight paths of aircraft with considerably greater precision than can be done manually in the time available.

A digital display system to back up the present azimuth and elevation display equipment for the Mill Village satellite ground station was designed, constructed, installed and placed in operation in November 1967. This equipment has improved the reliability of the overall display system and has also freed the site computer for other data processing tasks.

The computer program for the automatic processing of field measurement of instrument landing systems at airports was written. The program enables computer analysis and automatic plotting of various parameters of the glide path and localizer of instrument landing systems at airports in Canada. The computer process replaces manual processes previously used and is currently in use on a continuing basis for this purpose.

Film digitizing equipment with the precipitation data integrator has been designed and is under construction for the Climatology Division of the Meteorological Branch to process weather radar information from photographic film automatically. The equipment will be used to extract rainfall information to develop monthly, seasonal and annual precipitation maps over selected watersheds and ungaged areas, such as the Great Lakes. The equipment is now approximately 80 per cent complete.

A study for the automation of the Toronto air traffic control centre is under way. In co-operation with the Civil Aviation Branch, it is planned to develop the system to provide air traffic controllers with automatic data processing equipment to assist them in air traffic control operations.

A system called "circuit analyser" has been developed to provide a means of determining the utilization of telephone lines at air traffic control centres. The device monitors up to 150 circuits and records on magnetic tape the start

and end of every telephone conversation. A computer program to process the data on the magnetic tapes and to convert it to printed page and graphical report form has been written.

On behalf of the Department of Fisheries, a study was made of a system for automatic collection of meteorological oceanographic position locations and fishing conditions from up to 500 instrument fishing trawlers and the dissemination of data in facsimile form to ships was conducted.

Navigation Aids, Radar and Video Systems—All major sub-systems for equipment designed to aid navigation on the St. Lawrence River have been completed. The initial testing will be done on the Ottawa River, with subsequent tests on the St. Lawrence.

A device has been built to give angular information on the pitch and roll motions of a surface vessel. This electronic inclinometer, not using the pendulum principle, is now ready for calibration.

The problem of measuring high altitude winds has been studied during the year. The use of meteor trail measurements for this purpose is being considered, and the University of Western Ontario proposal to carry out further work in this field has been accepted.

A data extraction system for recording outputs for vertically pointing radar has been completed. So far, an adequate radar suitable for meteorological purposes is unavailable and the problem is being studied further.

A 9 mm wavelength radar, rented and installed at the Ottawa international airport in February 1968, is being evaluated for its potential as a means of detecting surface movements of aircraft and vehicular traffic. However, results to date show some system deficiencies.

A method of remoting radar data for Quebec Harbour radar over a narrow band transmission system has been investigated. An order has been placed for a system called "Videx" for evaluation of its usefulness to transmit radar video over a narrow band channel.

A method for absolute calibration of radar echo amplitude has been developed and equipment based on this method was built to operate with C-band weather radar. This will enable the determination of the rate of rainfall at selected points within radar coverage. A paper has been prepared which will be given in August 1968 at the World Meteorological Conference which will be held in Montreal and Toronto.

Omega navigation equipment was installed on board the CCGS *Labrador* and signal recordings were made during the ship's tour of the Arctic. The results were sufficiently encouraging to proceed with further investigations. The second phase, consisting of trials using a Caesium Frequency Standard and two receivers, was prepared, and tests will be run during May 1968, recording phase and amplitude variations. During the fall of 1968, this testing will be repeated to determine the extent of seasonal as well as diurnal variations of these parameters. A paper will be prepared on this during 1968-69 for presentation at a navigation conference.

Several beacon equipments were tried on the helicopters to determine their usefulness as radar transponders for tracking helicopters from icebreakers. Several helicopter trials have been made and, although results were very encouraging, as yet no equipment has been found which fulfills all the departmental requirements in this area. In this connection, studies of solid-state oscillators were

started in expectation that these may be used to replace travelling wave tubes, thus solving various problems inherent in their use. During 1967, tenders were called for radar digitizers and the display system required to meet the Canadian requirement for radar data remoting for air traffic control. A contract was awarded for the development of the system under departmental supervision. Equipment delivery is expected in January 1969. Plans and construction of requisite test equipment, including necessary microwave link installations, were completed. Carrying out of the plans by completion of necessary details is now in process.

The problems associated with long distance transmission of digital data via telephone type channels have been investigated. A tentative specification defining the parameters of the line has been prepared and forwarded to the line companies for comments. Equipment has been developed for measurements of errors in transmitted digital data. Field test equipment has been developed and built, which will enable testing of data transmissions in the field.

To assist in the evaluation of the radar digital data transmission system, a secondary radar target simulator has been developed. The simulator will produce various controllable combinations of "garbled" replies to simulate two aircraft flying at approximately the same range and azimuth.

Two microwave links have been installed to remote the primary radar video and the secondary surveillance radar video to the Telecommunications and Electronics systems laboratory. This will supply raw radar data for evaluation of the radar digital transmission system.

Of a number of models that have been evaluated, the desirable ones have been selected and will be used with the radar digital data transmission system.

A thermo-electric generator has been operated continuously since August 1965 to estimate the duration of life of such devices. With the exception of resupplying it with fuel, this unattended generator has operated without failure. The purpose of this test is to find a system capable of producing electric power for remote and unattended facilities. The generator uses propane as fuel, but research is under way to determine if standard liquid hydrocarbon fuel can be vapourized by supersonic techniques. Such techniques are safe and economical of power and can be easily controlled to produce the required size of fuel particles. If successful, such fuel will be used instead of propane to simplify logistic problems in the Arctic.

General—Work continued on the preparation of technical guidance material on power sources for telecommunications purposes in isolated areas as a contribution to the work of Special Autonomous Working Group No. 4 of the International Telegraph and Telephone Committee (CCITT).

Studies started in 1967 and in progress include: analysis of communications receive and transmit equipment performance requirement for slow speed data transmission system; analytical study regarding signal impairment due to non-linearities in travelling wave tube repeaters for multiple signal operation in the spatial and terrestrial environment; a study of departmental facsimile transmission requirements and an evaluation of transmission techniques commenced in February 1968 with the objective of improved circuit utilization; and the application of solid state techniques and integrated circuitry to system design is being evaluated to determine the cost, performance and reliability aspects and their suitability for use in departmental facilities.

Landlines Services

Air Traffic Control—Air traffic control and air movement information service national interphone networks were extended to provide service at Abbotsford, Pitt Meadows, Kelowna, Comox, Terrace, Smithers and Cambridge Bay; new circuits were added between Vancouver-Pitt Meadows, Moncton-Gander, and "hot line" circuits were installed between Saskatoon-Regina, Toronto-Buttonville, Toronto-Toronto Island, and Montreal-Quebec City.

Push-button control panels and associated electronic equipment for the termination of interphone circuits at area control centres, terminal control units, control towers and air traffic control training schools were installed at Sept-Iles, St. Johns, Baie Comeau, Ottawa, Sydney, Gander, Fort St. John, and Lakehead.

Two-digit selective signalling was provided on air traffic control interphone circuits Toronto-Ottawa, Moncton-Gander, and Montreal-Burlington.

Arrangements were made to lease dataphone/dataspeed facilities between Washington and Gander in conjunction with the Gander automatic air traffic system (GAATS).

An order was issued for provision of leased electronic equipment for the analysis of various loading criteria on national interphone networks and local circuits terminated at the Toronto area control centre.

Leased facilities were provided for remote control of radio transmitter receiver equipment for air/ground peripheral (PAL) communication between Sudbury-Toronto, St. Catharines-Toronto, and Gander-St. Anthony, and air traffic control interphone circuits Moncton-Goose Bay, Winnipeg-Lakehead, Vancouver-Tofino were modified to provide dual ATC/PAL service.

Arrangements were made with United States Air Force representatives for the use of voice channels in the military communication system of the Distant Early Warning (DEW) line in support of the northern control of air traffic by the Edmonton area control centre.

Air and Marine Operations—The airops national teleprinter network was extended to High Level, Alta., and Kamloops, B.C., and new circuits were provided between Goose Bay-Montreal, Gander-New York, and Edmonton-Hay River. Telex service was also provided at Goose Bay and at Grindstone, Magdalene Islands.

Costing and miscellaneous provisioning data is being co-ordinated and assembled for the task force studying the feasibility of converting and upgrading the aeronautical fixed telecommunications network (AFTN) from a combined manual/semi-automatic switching system to a centralized computer based system.

Departmentally-owned teleprinter equipment was replaced by leased units at Cambridge Bay, Sachs Harbour, Resolute Bay, and Ennadai, N.W.T., and at Brochet, Man.

Meteorological Services—The weather facsimile national network was extended to Kingston, Sarnia, Lethbridge, and Kamloops.

The weather teleprinter national network was extended to Blanc Sablon, Gaspé, and Havre St. Pierre, P.Q., Kingston, Sarnia, and Geraldton, Ont., Regina, Sask., and High Level, Alta., and supplementary circuits were established between Vancouver-Edmonton, Halifax-Gander, and Vancouver-Sandspit.

Temporary facsimile or teleprinter facilities were provided in support of Canadian Forces Day at various locations; the Fisheries Exhibition at Lunenburg,

N.S.; ice reconnaissance at Frobisher Bay, Goose Bay, Gander, Halifax, Sydney, and Mont Joli; the National Museum at Ottawa; hail studies and hail suppression at Calgary; and forest fire protection at Vancouver.

An order was issued for the upgrading and conversion of the existing leased manually operated national teleprinter networks to a centralized computer mode of switching operation, scheduled for completion early in 1969.

Marine Traffic Control—The marine traffic control system for the control of shipping in the lower St. Lawrence River was extended eastwards by the installation of very high frequency (VHF) transmitters/receivers and associated leased control circuits/equipment at Baie Trinité, Baie Comeau, and Rimouski, P.Q.

A satellite centre to the prime marine traffic control centre at Quebec was established at Montreal. Orders were issued for the lease of communication facilities in support of the relocation of the marine information centre and pilotage despatch office at Montreal.

Miscellaneous—Orders were issued for the provision of leased communication circuits between Ottawa-Pembroke, Ottawa-Montreal, and Ottawa-Toronto in support of the Department's research and development program.

Negotiations were completed between departmental representatives and communication common carriers for the issuing of a standard "Landline Practice for Voice Frequency and Control Circuits", and preliminary negotiations are under way for the preparation of a standard on "Landline Circuit Performance Testing".

Negotiations were also completed with various telephone companies for handling of air/ground radio telephone traffic on an emergency basis in support of the safety of commercial airline operations.

Studies were implemented and recommendations made to provide landline distribution ducts and communication equipment space requirements for the new departmental headquarters building being planned for Ottawa, and for various other new departmental buildings across Canada.

Work continued on the preparation of master plans recording the physical location and other statistics of all underground telecommunication cables installed on departmental property across Canada.

International Conferences

To give greater emphasis to Canada's international telecommunications involvement, an International Policy Division has been organized and is being staffed with qualified experts in this field.

Pursuant to its responsibilities of representing Canadian interests and participating in international consultative and regulatory forums, the department, as in past years, participated and co-ordinated Canadian involvement in a number of international organizations meetings including the International Telecommunication Union (ITU); the Commonwealth Telecommunications Council; International Telecommunications Satellite Consortium (INTELSAT); Inter-Governmental Maritime Consultative Organization (IMCO); and the International Civil Aviation Organization (ICAO). Departmental representatives also participated in the Fifth International Telegraphic Congress; NATO/ARFA, Allied Radio Frequency Agency; UN Working Group on peaceful uses of outer space; and the joint US/UK/France/Canada working groups on aeronautical satellites.

Meteorology

Forecast Services—With the reorganization of weather services in the prairie provinces completed, aviation and public forecasts for Saskatchewan are now issued from the Regina weather office. Forecast services for Manitoba and Alberta are provided from Winnipeg and Edmonton respectively. Public forecasts, on a routine basis, were initiated to provide services for the expanding economic activity in the North Athabaska Region of Alberta. New weather offices were opened at Kingston and Sarnia, Ont.; Lethbridge, Alta.; and Kamloops, B.C.

An experimental program of agrometeorological radio broadcasts was conducted in the south-central regions of Ontario in the growing period June-September 1967. Broadcasts provided weather data and forecasts of importance to current farming operations and were prepared by a representative of the Ontario Department of Agriculture with the support of the Toronto weather office.

Special weather forecasts for the Expo 67 fair site were issued daily and given national and international distribution.

A permanent weather display was presented to the National Museum of Science and Technology in Ottawa.

As weather, wind and waves are of importance to off-shore oil drilling operations, the requirements for information and forecasts were examined with representatives of the industry for the purpose of developing appropriate support services.

Communications—The meteorological teletype system, with 58,500 miles of circuit, served 384 stations with 693 connections. The weatherfax system operated to 102 stations equipped with 128 connections over 19,000 miles of facsimile network.

Supplementary teletype circuits paralleling existing circuits connecting Vancouver-Prince Rupert-Comox, Vancouver-Edmonton, Montreal-Mont Joli-Scheferville, Montreal-Halifax, and Halifax-Gander-Goose, were installed to improve the distribution of traffic and relieve congested circuits.

To provide increased capability at less cost, the meteorological teletype system will be converted to computer operation, using facilities provided by Canadian National-Canadian Pacific Telecommunications. The change is expected to be implemented early in 1969.

Surface Observation Program—Surface land observations provided basic weather information in synoptic or hourly form from 296 stations across Canada, a net increase of seven stations during the fiscal year. Forty-eight of these stations were operated by outside agencies through terms of a formal contract agreement. Winds aloft were reported from 33 pilot balloon stations.

Special programs were carried out for noctilucent clouds, aurora, soil and precipitation sampling. Solar and terrestrial radiation measurements were provided by 31 stations and ozone observations by four stations.

Marine Weather Observations—Essential information at sea was provided by 150 voluntary ship reporting stations. The automatic weather reporting buoy, NOMAD, on loan from the United States Navy, continued to operate successfully off the Nova Scotian coast, although it broke its moorings in January and was later recovered 400 miles off station.

Ice Observing—The two specially modified and instrumented DC-4 aircraft continued their operations in support of shipping in ice-congested waters from the Great Lakes to the Gulf of St. Lawrence and up to the Arctic. The first year of a five-year contract was completed, with some interruption to the ice observing service because of aircraft unserviceabilities. An annual training course was given to qualify new ice observers to fill vacant positions.

Arctic Program—The five Joint Arctic Weather Stations—Resolute, Alert, Eureka, Isachsen and Mould Bay—established in 1947 continued in operation by the United States Weather Bureau and the Canadian Meteorological Branch.

Surface and upper air meteorological programs as well as observational programs of aurora, noctilucent clouds, radiation, sunshine, soil temperature, radioactive fallout, and sea ice thickness were carried out regularly. The additional program of ozone measurements was carried out at Resolute.

Support was given the Department of Energy, Mines and Resources for the Polar Shelf and for seismic and magnetic projects, and to Atomic Energy in the operation of the superneutron monitor at Alert.

The airstrips at these stations served airlift resupply operations as well as aircraft of numerous exploration parties.

Upper Air Observations—The upper air observing network consisted of 33 stations, including the five Arctic weather stations and ocean weather station *Papa*.

The new electrolytic hydrogen generators were certified for operational use by the Canadian Standards Association (CSA) in July, after several minor modifications were made. Special modification kits had to be designed for the plants already in operation at various stations, and in October the first CSA approved generator was placed in service at Prince George, B.C. A total of 21 generators have been commissioned and are now in use. By the end of the next fiscal year, it is expected that all upper air stations will be so equipped.

High Atmospheric Vehicles—Two engineers with experience in the rocket field were added to the Basic Weather staff, the senior engineer heading the High Atmospheric Vehicles Section. Initial plans are under way for the beginning of rocketsonde probing of the very high atmosphere above the heights to which rawinsondes can reach. Plans being developed are for suitable and accessible sites, types of equipment required, procedures for launching, range safety procedures, procedures for acquisition and computation of data and staff training. Liaison has been established with both Canadian and United States agencies interested in high atmospheric rocketsonde programs.

Instrument Developments—Considerable research and engineering went into the development of a recording precipitation gauge for recording rain and snowfall. A new large capacity standard raingauge is also being developed and a number of alternative designs are under test. Development of an accurate pressure altimeter which will remotely display altimeter setting values digitally in towers has been completed and preparations are under way to have a quantity manufactured to this new design.

A battery powered hydrometeorological automatic weather station is still under development. A number of the landline automatic stations previously designed by the Branch were received from the manufacturer. An automatic station

of similar design was operated on the grounds of Expo 67, reporting the hourly weather by teletype to the Montreal forecast office. The system was then re-outfitted and installed on Gonzales Heights, Victoria, to relay weather information to the forecast office at Vancouver international airport.

Weather Radar—A commercial equipment designed to display and record the data received from a weather radar was extensively tested. Although the system was found to be technically inadequate, it provided a better understanding of the type of equipment that must be designed.

The windfinding radar installed on the Pacific weatherships was evaluated for acceptance purposes.

Upper Air Equipment—A three-year supply of radiosondes was ordered, and ten additional radiotheodolites have been ordered to complete the reinstrumentation of the upper air network with modern equipment. A second procurement of runway visual range computers to provide the facilities for these measurements on instrument runways is under way.

Climatological Networks and Stations—At the end of the fiscal year, there were 2,281 stations in the climatological networks, including 244 synoptic or principal climatological observing stations, 1,486 ordinary climatological stations, and 485 stations observing precipitation only. Of these, 2,240 stations reported daily precipitation, 1,756 reported daily temperature extremes, 304 reported rates of rainfall, 224 reported hourly wind data, 220 reported daily bright sunshine duration, and 111 stations conducted snow surveys in season.

Climatological Research and Special Programs—Consultation and studies to provide climatological information in support of site selection, exploration, operating and construction problems, sea transport and communications were undertaken for a number of areas in northern Canada. The *Climate of the Canadian Arctic* was published in the Centennial issue of the *Canada Year Book*. In collaboration with the Canada Department of Forestry and Rural Development, radiant energy distribution within a red pine forest canopy was measured. Consultation was also provided Canadian participants in the International Biological Program. The Bioclimatology unit contributed to the preparation of and edited a report, "Plant Injury by Air Pollution", which will be published by the World Meteorological Organization. Research in evapotranspiration dew disposition was continued.

Special research included microclimatological studies of potential fruit production areas near Georgian Bay and the urban environment in Toronto; freezing precipitation and contingent wind and temperature data for engineering design of structures, power and communication lines; the areal variation of climatic factors affecting airports for airport selection in the Montreal area; and the development of statistical procedures for predicting the occurrence, depth and water content of persistent snow cover in the prairie provinces to aid in engineering design and agricultural decisions.

Hydrometeorological Research—A major study was undertaken of the critical meteorological conditions related to maximum floods affecting the Hamilton River-Churchill Falls project, and by the end of the year a similar study was completed involving all of Newfoundland and Labrador.

Provisional evaporation maps of Canada were published and an atlas of rain-fall-intensity-frequency-duration maps for Canada was completed and is being printed. At the request of the International Joint Commission's Water Levels Board, statistical analyses of lakeshore winds, simulated over-lake winds and the resulting waves, were completed for each of the Great Lakes. A leading role in planning for the International Field Year on the Great Lakes (IFYGL) was continued. This is an integrated program of physical research proposed for 1970 and sponsored by the United States and Canadian National Committees for the International Hydrological Decade (IHD). Major support was provided for a large number of IHD projects across Canada. Co-ordination of programs and research were carried out for eight projects involving evaporation, radiation, energy balance and water balance studies and satellite photo interpretation. Meteorological advice, assistance and equipment were provided for 34 additional projects. The Director continued to serve on the Canadian National Committee for the IHD.

Physical Research—Research into the physics of clouds and precipitation was continued through contracts with McGill University for studies of Alberta hailstorms and with the University of Western Ontario for studies into the detection and tracking of lightning. Studies of electricity in the atmosphere were furthered by commencement of atmospheric electricity measurements at the meteorological research station near Toronto. Research studies on the data collected by the precipitation physics project in western Quebec between 1960 and 1963 were continued, and four technical reports dealing with this project were published.

Plans have been completed for the publication of a quarterly meteorological tower bulletin containing data from various towers in Canada, and equipment for the direct measurement of shearing stress in the surface layer has been designed and constructed, as well as a study completed, and a report is in progress on atmospheric refractometry at high relative humidities.

Micrometeorological Research—Work is continuing on urban air pollution studies, the relationship between optical seeing and low-level thermal turbulence, and instrumentation for the direct measurement of vapour pressure using thermocouples.

Ozone Research—The measurement of total ozone at a network of five stations continued. Forty-five ozonesonde soundings of the stratosphere were made at Resolute. A computer program for the reduction of ozone data was completed and the publication of world ozone data is under way.

Development of a research observatory at the Queen Elizabeth II observatory site continued, instrument intercomparisons were conducted and a temporary observatory trailer was installed.

Radiation Research—The national radiation centre issued 100 calibration certificates and improved calibration methods and facilities. A pilot project for radiation soundings of the atmosphere commenced.

Synoptic Research—Research activity included short-range forecasting, especially the development of an automated, objective short-range forecast methodology; mesometeorology in which the major project has been directed to

setting up a local network of automatic weather stations; the use of weather satellites for the Meteorological Branch; and aeronautical meteorology involving experiments on meteorological aspects of aircraft flight.

Dynamic Research—The upper atmosphere program has been expanding, including the development of special observation systems on noctilucent cloud and airglow, and the study of various observational data (ozone, noctilucent cloud, rocketsonde radioactive debris) to obtain information on upper atmospheric circulations. In addition, there have been theoretical studies to help develop better numerical weather prediction methods.

Meteorological Training—During the fiscal year, 49 general science university graduates were recruited for the Meteorological Branch training program. Of these, 35 graduated, five of whom are immediately acceptable to either McGill University or the University of Alberta for 1968-70 M.Sc. courses.

There were 10 honours university graduates recruited for training. Under training in the first year M.Sc. program were 13 students and 12 in the second year. Students undertaking advanced forecasting training totalled 17, one of whom was under the aegis of the World Meteorological Organization.

Students taking meteorological courses at the Air Services Training School, Ottawa, and the Federal Electric Corporation School at Streator, Illinois, totalled 698, compared with 650 the previous year.

Three upper air training courses were completed at the Upper Air Training School (UATS), Scarborough, with a total enrolment of 79 students including five Department of National Defence personnel. There were 56 graduates, including four from the DND. The courses averaged 16 weeks, the longest being 17 weeks and the shortest 15 weeks, the duration of each course being determined by the size of the enrolment.

To extend the scientific knowledge level of operational professional staff, a weather office workshop was held at Regina in September, and a weather central refresher course was conducted in Toronto in February.

Development and Evaluation—Eight studies were undertaken by the Scientific Development and Evaluation Unit, which is responsible for developing quantitative short-range forecasting techniques.

Among these was a study which resulted in the development of linear regression equations for predicting the low-level vertical profiles of temperature and moisture. In addition, quantitative methods for predicting both minimum and maximum temperature were developed and evaluated. Work also continued on the development of auxiliary analysis procedures and diagnostic routines for operational use in weather offices.

Grants in Aid of Research—Of 32 applications received from 15 Canadian universities for grants in aid of meteorological research, the Advisory Committee recommended 20 in grants totalling \$149,300. The Advisory Committee consists of representatives of the National Research Council, Defence Research Board, McGill University, University of Alberta, and the Meteorological Branch.

Film—The film on the work of the Meteorological Branch, entitled *In One Day*, produced by the National Film Board, was given theatrical release in March 1968 and received favourable comment from reviewers and the general public.

Cloud Charts—A coloured chart of cloud photographs, with captions, was added to the increasing number of meteorological educational publications produced in French.

Central Analysis Office Program—The Central Analysis Office at Montreal International airport prepared basic surface and upper level weather map analyses, and forecast charts for transmission by facsimile to weather centrals, weather offices, and Department of National Defence meteorological establishments. Weather advisories were also transmitted by teletype. Increasing use was made of the expanded output of computer produced analyses and prognoses in the preparation of these charts and advisories, and of computer produced auxiliary charts to provide support for the forecasting system. The CDC G-20 computer system, in use since 1962, was replaced in August 1967 by an IBM 360 model 65H system. Research and development work was carried out on a wide range of projects connected with the automation and extension of the Central Analysis Office operational program.

World Meteorological Organization (WMO)—A five-man delegation, headed by the Director of the Branch, attended the fifth world meteorological congress at WMO headquarters in Geneva in April 1967. Attention was focused on the World Weather Watch and decisions that had to be made. The potential benefits to members were reviewed and the plan for 1968-71 was adopted. This plan covers substantial improvements in the global observing, telecommunications and data processing systems, in training and education, and planning the global atmospheric research program. Implementation is based on improvements by countries, use of the United Nations Development Program, (UNDP), bilateral and multilateral arrangements and financial or equipment and services contributions to the WMO voluntary assistance program.

Two of the eight technical commissions held their four-yearly sessions—the Commission for Agricultural Meteorology at Manila in November 1967 and the Commission for Aeronautical Meteorology at Montreal also in November. At these meetings, Canada was represented by Branch meteorological experts, and has experts assigned to working groups for all of the eight technical commissions.

Three of the fifteen presidents of the constituent bodies of WMO are staff members, the president of the Regional Association for North and Central America, president of the Technical Commission for Climatology, and president of the Technical Commission for Maritime Meteorology.

An International Conference on Aeronautical Meteorology was held in London in January 1968 to discuss present day and future developments in aviation and related weather services. Members of the Branch's research and development staff presented papers and gained useful insight into current problems.

The director participated in the nineteenth session of the Executive Committee at which decisions on the implementation of the World Weather Watch and organization of the Global Atmospheric Research Program, being jointly planned by WMO and the International Council of Scientific Unions (ICSU), were made.

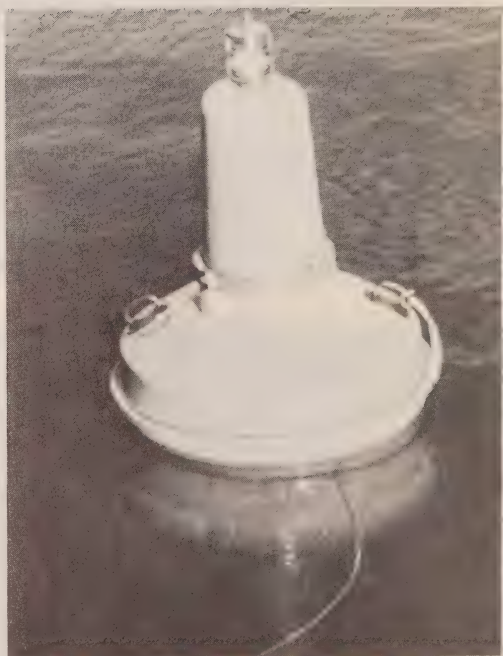
In accordance with the principles of World Weather Watch, arrangements were made to use the output of the World Weather Centre, Washington, D.C., in providing upper wind forecasts to long-range aviation, thereby effecting a saving in the use of Canadian facilities.



D.O.T. JetRanger.



Meteorological technician teletyping a weather report to weather stations across Canada.



New type fibreglass buoy set out to mark small craft channel to Expo 67 marina.



CCGS Chesterfield replaces
CCGS J. E. Bernier



Burleigh Falls lock from

Jean Bourdon launched
March 27, 1968.



G Saurel replaced by the new
CGS *J. E. Bernier*.

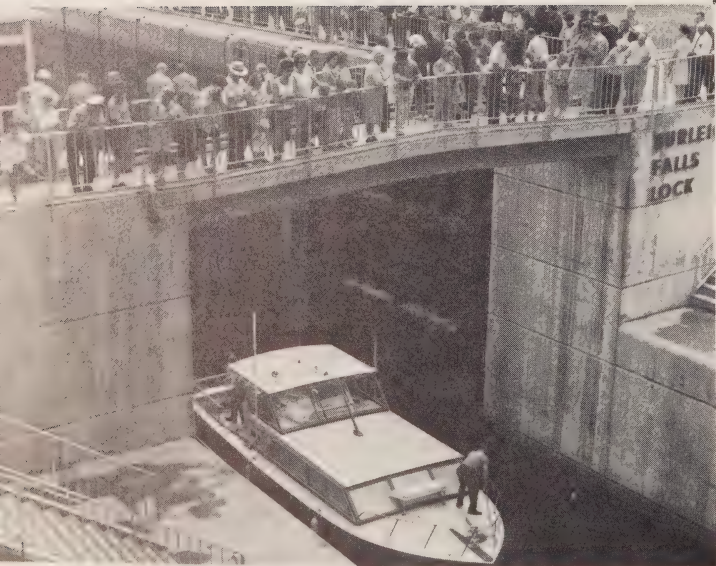


helicopter at Triple Island
these near Prince Rupert,
B.C.

Marine Traffic Control Centre at
Quebec, P.Q.



Icebreaking ship models at Expo 67, demonstrate operations in the
"Little Sea", a small artificial lake near the Canadian Pavilion
(Katimavik).



Burlington Falls Lock on the Trent Canal system, officially opened August 18, 1967.

Technical Assistance—Five staff members were made available to WMO. Two technical assistants were on leave of absence to serve in the Secretariat in Geneva, one returning in September 1967 and the other in January 1968. Three were on technical assistance missions, one in Pakistan until February 1968, another in Libya until August 1967, and a communications expert who is establishing a communications system in Iran. A member of the training division acted as director for the seminar on meteorological training at Santiago, Chile, in November 1967.

Several students from other countries received professional training in Canada under External Aid sponsorship. A member of the Guyana service received nine months' training in agrometeorology in 1967, a WMO fellow from Hungary spent several months obtaining training in atmospheric research, and arrangements were made for a forthcoming three-month training course for the new director of the East African meteorological service.

Meteorological Services to the Department of National Defence (DND)

Services provided to the Department of National Defence included weather data from the basic weather observing network, climatological service, connections to the meteorological communications system, forecasting service, and centralized weather analysis service. Meteorological equipment and supplies, as well as instrument service and limited operator and maintenance training, were also provided.

The Department of National Defence operated weather forecasting and briefing facilities in a number of HMC ships and the majority of Canadian Forces bases in Canada and abroad.

Meteorological training was provided for meteorological personnel at the Canadian Forces School of Meteorology and for operational personnel at a variety of schools and operational training units.

A small meteorological component was employed in the activities of the Defence Research Board. Some 155 Meteorological professional staff served with the DND either on secondment or as military officers on short-service commissions.

In addition to broad support for the meteorological programs of the DND, technical assistance was provided as required, particularly in connection with special climatological and research studies.



CCGS J. E. Bernier, officially accepted for service at the Quebec Marine Agency on November 29, 1967.

MARINE SERVICES

Aids to Navigation

The aids to navigation system comprises manned stations where major lights, sound signals and radio beacons operate, and unmanned stations fitted with automatic equipment or equipment that is remotely controlled. Buoys, both lighted and unlighted, some equipped with sound signals, are maintained, and beacons, dolphins and daymarks are provided.

During the year, various programs were initiated to improve the system, and close liaison is maintained with shipping interests, associations, pilotage organizations and other interested groups.

All battery-operated lights are being converted from 6 volts to 12 volts, which will improve light intensity and facilitate equipment procurement. Standard flash characteristics have been introduced and an equipment procurement program has been developed to coincide with the completion of the changeover.

Frequent and detailed inspection procedures for aids to navigation have been laid down for field personnel, and specifications are being prepared for underwater examinations requiring the services of specially equipped companies.

The program of grouping minor aids—buoys and automatic lights—and calling tenders for their maintenance and operation continues where it is necessary to have this work done by contract.

Navigation safety and the proper use of navigational aids was encouraged among pleasure craft operators by exhibits at Expo 67, at boat shows and at marine museums.

Last year, hovercraft demonstrations were observed to assess the possibility of their use in servicing aids. Their use is being further evaluated.

Construction—The program of providing fixed piers continued in the St. Lawrence River to aid the increase in shipping and the extended periods of navigation in the waterway. Five lightpiers with concrete towers for three ranges in Lake St. Francis were completed early in the navigation season and put in operation. Two similar lightpiers for the Caughnawaga Range in Lake St. Louis were completed and will be placed in operation for the 1968 navigation season. A light-pier at Yamachiche Bend in Lake St. Peter was 60 per cent complete by the close of navigation.

Foundation investigation and borings were completed at nine sites for future lightpiers in Lake St. Peter, and engineering and plans were completed for the fixed lightpier 81-D in the Detroit River.

To improve living conditions and provide accommodation at lightstations, 26 dwelling units were completed during the year. In addition, three fog alarm and machinery buildings and eight major towers were completed at lightstations. Improvement in access roads to lightstations is continuing, and 16 projects were begun and eight were completed during the year.

The program of marine agency establishments reconstruction continued throughout the year. The new shops building at Charlottetown, P.E.I., and refurbishing the shops building and wharf lighting and electrification at Sorel, P.Q. were completed. A new combined office, stores and shops building at Hay River, N.W.T., was also completed and work started on a similar building at Selkirk, Man.

In addition to these major projects and the regular repair program, a number of minor projects such as lighthouses, daymarks, and cribworks were constructed.

Mechanical Equipment—Supplying mechanical equipment to the various marine depots continued during the year. Lightstations electrification was accelerated by the acquisition of more than 80 diesel-driven generating plants, most of which have already been installed. From experience gained with this kind of equipment, a new specification was drawn up which will form the basis of standardized future requirements of these machines.

Some consideration was given to the equipment necessary for the introduction of semi- and completely automatic generating sets for use at unattended light and fog alarm stations and orders have been placed for two sets of such machinery for evaluation purposes. These machines will be located in Ottawa and monitored electronically, and will be evaluated in 1968 and 1969.

Fibreglass reinforced plastic fuel tanks for diesel oil storage have proved satisfactory over the past several years and more have been supplied this year. Their light weight and minimal upkeep requirements make them especially suitable for the more remote lightstations. The use of this material for buoys is still under study and, for the smaller sizes, results appear quite promising.

The use of snowmobiles at lightstations where snow removal is impracticable continues to be quite satisfactory. More were supplied last year at a cost which compares favourably with the cost of snowplowing for one season.

The Canadian-made fog signal (Airchime) has proved satisfactory and, except in one or two instances, will undoubtedly replace the old familiar diaphone. Operating and maintenance cost of the Airchime is very low and the machinery to drive it is only one-fifth the size of the diaphone equipment.

Fibreglass buoys are being given extensive field tests in the small boat channels in the St. Lawrence and Ottawa Rivers, which were improved for the traffic to Expo 67, and will be continued not only to encourage small boat traffic, but keep these craft in their own channel in the St. Lawrence River away from the deep draft channel to Montreal and the Seaway.

Nylon moorings for both small-sized buoys and the large, steel signal buoys are being evaluated in field tests.

Electrical Equipment—Specifications were issued for new electronic flashers for buoy and range lights, and for electrical generator units used in lightstations. Engineering investigations were made to prepare specifications for automatic control of three generator units, and to monitor the operation of the aid equipment at unattended lightstations.

The conversion program of changing the buoy electric lamps from 6 VDC to 12 VDC is progressing satisfactorily. This standardization on 12 VDC battery supply and lamps is in line with the standard of the United States Coast Guard.

The evaluation of two types of electronic fog detectors was completed and results confirmed their function of reliable detection of fog in all weather conditions. One unit was installed on the East Coast, another on the West Coast, and one at a critical area in the St. Lawrence River.

The Xenon scintillating buoy lights, first installed in 1967, were sufficiently well received by mariners to warrant the procurement of 300 additional units. These were installed in critical areas throughout Canada and results are considered good. For example, these lights are easily detected when placed in the Fraser River where the background lights of New Westminster previously made detection difficult. The use of Xenon lights is being studied for other applications to assist the mariner.

A new polycarbonate plastic lens was designed and evaluated as a replacement for the present glass and acrylic lenses used in buoy and range lights. This type of plastic is very strong and will not shatter on impact from rocks and bullets.

The test engineering and photometric laboratory examined and evaluated many types of dry and air-depolarized batteries for voltage and discharge characteristics under the extreme low temperature environments found in Canada. New types of gaseous discharge lamps and electric lanterns were subjected to beamwidth and intensity (candlepower) measurements. In the past year many new products were introduced by industry which required evaluation as an aid to navigation, such as magnesium batteries, electronic flashers, lamp changers, electronic timers, plastic lenses, lanterns, and generator controls.

A system was designed for floodlighting two breakwaters and Vardy's Island in Port aux Basques harbour to assist the large CNR ferries during entrance and departure in poor visibility conditions. The installation will be completed by the fall of 1968.

Lights and Fog Signals

as of March 31, 1968

District	Oil Vapour Lights	Wick Lights	Hydro Lights	Station Generator, Electric	Battery, Electric	Acetylene Lights	Total Lights	Diaphones	Air Horns	Whistles	Electric Horns	Mech. Bells and Gongs	Hand Horns	Total Fog Signals
St. John's, Nfld.....	3	20	69	30	166	113	401	52	6	7				65
Charlottetown, P.E.I.....	9	6	146	1	196	8	366	7	4		2		5	18
Dartmouth, N.S.....	1	5	157	22	75	6	266	23	1	14	7		3	48
Saint John, N.B.....			144	14	36	2	196	21	18	4	10	3		56
Quebec, P.Q.....	5	19	170	20	158	19	391	33	6	15	1			55
Sorel, P.Q.....			79		147		226							
Prescott, Ont.....			156	5	235	1	397	13	8	6	3	3	2	35
Parry Sound, Ont.....			192	24	350	10	576	25	4	9	3	1	5	47
Victoria, B.C.....			93	27	412	1	533	25	14	6	4	2		51
Prince Rupert, B.C.....			10	14	207		231	9	5		1			15
Hay River, N.W.T.....			2		172		174							
TOTALS.....	18	50	1,218	157	2,154	160	3,757	208	66	61	31	9	15	390

DEPARTMENT OF TRANSPORT

Buoys, Dolphins and Beacons

as of March 31, 1968

District	Lighted Buoys	Light and Sound Buoys	Total	Cans, Conicals, Spars, Floats	Total Buoys (All Types)	Unlighted Dolphins	Stakes, Bushes, Balises	Unlighted Day Beacons	Total
St. John's, Nfld.....	63	37	100	166	266		8	62	70
Charlottetown, P.E.I.....	158	49	207	1,006	1,213		2,003	11	2,014
Dartmouth, N.S.....	82	207	289	1,240	1,529	4	28	31	63
Saint John, N.B.....	34	93	127	772	899		692	27	719
Québec, P.Q.....	148	41	189	72	261	10	26	15	51
Sorel, P.Q.....	671		671	1,198	1,869		6	32	38
Prescott, Ont.....	343	12	355	874	1,229		134	2	136
Parry Sound, Ont.....	119	15	134	2,136	2,270		3	350	353
Victoria, B.C.....	51	24	75	219	294	61		228	289
Prince Rupert, B.C.....	4	22	26	73	99	9	72	61	142
Hay River, N.W.T.....	26		26	616	642		38	1,163	1,201
TOTALS.....	1,699	500	2,199	8,372	10,571	84	3,010	1,982	5,076

Navigable Waters Protection Act

On October 1, 1966, the Minister of Transport assumed the administration of the Navigable Waters Protection Act, formerly administered in part by the Minister of Public Works.

The processing of applications under this Act has been streamlined to minimize the time required to investigate and issue the documents. Field staff to handle these inspections is being increased to enable the Department to assume its full responsibility.

During the year under review, 511 applications were approved. Of the total number of applications received, 45 could not meet the requirements of the Act and were, therefore, rejected.

Prior consents to commence construction of projects before obtaining formal approvals totalled 67. Approximately 38 protests were received objecting to existing or proposed works. These were investigated and appropriate action taken.

International Participation

The Department was represented at the General Assembly of the Permanent International Commission of Navigation Congresses in London in June 1967. The work of the Commission embraces the study of the forces that affect the stability of marine structures and the exchange of technical information in the design and construction of harbour works, canals, and structures on marine sites.

The Department was also represented at the International Hydrographic Bureau Conference at Monaco. Uniformity of notices to mariners, lightlists, and the nomenclature of aids to navigation are of vital interest to the Department. The representative also visited the lighthouse services of Sweden and Trinity House in London to exchange technical information.

The Congress of the International Commission on Illumination met in Washington in June. Two aids to navigation engineers attended and participated in the preparation of a publication on the colours of signal lights. The committee of experts on the fundamentals of signal lights included a member from the Department. This committee is preparing a reference volume to provide engineers with the basic information for the construction and operation of signal systems for marine, air, highway, railway and canal traffic.

A team headed by a member of the Aids to Navigation staff spent three days in Washington studying the U.S. Coast Guard system of marking offshore platforms, artificial islands and drilling rigs for the protection of navigation. This activity is now beginning in Canadian waters and an effort was made to use the experience gained over many years by the U.S. Coast Guard and to promote uniformity in dealing with this problem on this continent.

The Department was also represented at the Second International Buoy Technology Symposium in Washington.

Canals

Pleasure boat traffic on the Rideau Canal in 1967 increased by 14 per cent over the 1966 navigation season, with a record of 62,274 lockages. Traffic on the Trent Canal System decreased by 15 per cent, with a total of 112,018 lockages. This decrease resulted from abnormal precipitation over the Trent and Severn watersheds in late June and early July, which in turn increased the flow in the

river sections of the system to the point where it was necessary, in the interest of safety, to close certain sections to navigation for periods up to three weeks.

The Quebec Canals—the Carillon, Ste. Anne, St. Ours and Chambly—also had increases in pleasure boat traffic.

Cargo through the Canso Canal totalled 916,843 tons, compared with 1,179,492 tons the previous year.

The Trent Canal rehabilitation program continued throughout the year. Lock No. 28, which replaces flight locks 28 and 29 at Burleigh Falls, Ont., was opened to navigation on June 1, 1967, and formally opened on August 18.

Other works on the Trent included converting the valve and lock gate operating equipment on Locks 35 and 42 from manual to electric/hydraulic operations; refacing large sections of canal walls at Locks 3, 4 and 9; completely restoring dam 8 at Lock 9 and Crab Lake dam; awarding two contracts and commencing work on the first phase of mechanization and rehabilitation of Lock 32 at Bobcaygeon; constructing new control buildings at Locks 7, 13, 32 and 45; 90 per cent completion of two new breakwaters at Gamebridge, Ont.; contract completion of the concrete sub-structure of the guard gate at Kirkfield and 90 per cent completion of the new sector gates and machinery; mechanization and rehabilitation of the Kirkfield Lift Lock, scheduled for completion during the fiscal year 1968-69, including modification of the automatic controls.

On the Rideau Canal, a new concrete wharf was constructed at the foot of the Ottawa Locks; a 300-foot concrete retaining wall was built above the lower lock at Nicholsons; pressure grouting of walls and sills was carried out at Chaffeys, Old Slys Lock and Locks 29 and 30 at Smiths Falls; new concrete walls were built above and below Beveridges (Lock 33); survey of the lock area and adjoining property with respect to the new Smiths Falls Lock was completed; new watch-houses were constructed at Burritts Rapids and Upper Brewers; a 1000-foot stretch of concrete retaining wall along the south side of Smiths Falls basin was replaced, together with posts and handrails.

Construction work on the new Quebec Canals continued, the St. Ours dam project being scheduled for completion in 1969. A new retaining wall at the upper entrance to St. Ours Canal was 90 per cent completed, a concrete well for storage of new steel stop logs was constructed, and the lower lock gates were replaced by new timber gates. At the upper entrance of Ste. Anne Canal, a new retaining wall, including new stop log gains was completed, a section of the guard pier was renewed and railings installed on both sides of the north retaining walls.

On the Chambly Canal, over 3,000 feet of banks were repaired, concrete repairs to wing walls of Locks 4, 5 and 7 were carried out, and lock floors repaired where necessary. Approximately 200 feet of aluminum floating docks with fingers were installed at St. Jean, P.Q., to accommodate pleasure craft, the machine shop was replaced, and a new maintenance office was constructed. Pre-engineering studies, surveys, and soundings were carried out in the Richelieu River area for the proposed new Chambly Canal.

Harbours and Property

Harbour Commissions—In the past three years, five harbours have been reconstituted under the Harbour Commissions Act, 1964—Lakehead, Fraser River, Windsor, Nanaimo, and Oshawa. Six Commissions are still operating

under earlier statutes—Hamilton, North Fraser, Toronto, Port Alberni, Belleville, and Winnipeg and St. Boniface. The latter conducts a unique river traffic control operation rather than a normal commercial shipping harbour.

Cargo handled by 10 Harbour Commissions totalled 51,502,000 tons. Of this total the Lakehead handled 15,629,000 tons, Hamilton, 10,563,000, North Fraser, 7,498,000, Toronto, 5,694,000, Fraser River, 5,118,000, Windsor, 2,950,000, Nanaimo, 2,709,000, Port Alberni, 891,000, Oshawa, 273,000, and Belleville, 177,000.

Revenues from all sources increased to \$10,930,738 from \$9,566,748, an increase of 14.3 per cent over 1966. This was achieved despite a four per cent decline in total cargo volume caused mainly by the month-long Seafarers International Union work stoppage and a drop in grain traffic. The share of total Canadian port tonnage handled by the Commissions increased slightly over last year to approximately 21.5 per cent.

By-laws of several Commissions were amended, including a revision of cargo rates at Toronto, and further progress was made towards the adoption of uniform systems of financial reporting.

Public Harbours—The limits of the harbours at Mulgrave and Port Hawkesbury, N.S., were extended to meet the requirements of increased shipping activity in that area. The number of proclaimed public harbours remained unchanged at 315, of which 113 were supervised by harbour masters appointed to apply the Public Harbours Regulations including the collection of harbour dues. In the fiscal year, dues collected totalled \$495,255, a reduction of \$54,516 from the previous year.

Summary and Harbour Traffic and Revenue—1967

TRAFFIC	(000 Tons Cargo)	% of Total
Harbour Commissions.....	51,502	21.5
Public Harbours and Wharves.....	117,177*	48.6
National Harbours Board.....	71,885	29.9
TOTAL*	240,564	100.0
REVENUE	Gross Receipts	%
Harbour Commissions.....	\$10,930,738	23.0
Public Harbours and Public Wharves		
Harbour Dues.....	495,255	1.0
Wharfage.....	1,899,713	4.0
	13,325,706	28.0
National Harbours Board.....	33,851,506	72.0
TOTAL REVENUE	47,177,212	100.0

*Net figure from D.B.S. including private wharf traffic.

Cargo through the ten major public harbours also fell below last year's levels, totalling 52.4 million tons compared with 56.6 million last year. Of this total, Sept-Iles handled 22,659,000 tons; Sault Ste. Marie, 4,563,000; Baie Comeau, 4,459,000; Sorel, 4,233,000; Port Alfred, 4,190,000; Sarnia, 3,885,000; Sydney and North Sydney, 2,699,000; Victoria, 2,542,000; Hantsport, 1,695,000; and Prince Rupert, 1,465,000.

The survey of West Coast small boat harbours was completed during the year and a comprehensive report was submitted to the Minister. Many municipalities, yacht clubs, commercial and trade organizations having a direct interest contributed written and oral submissions to the public meetings held during the survey. The report is now under study by the Department and other Canadian Government departments and agencies concerned.

In co-operation with the Department of Public Works, consultants were commissioned to conduct a comprehensive survey of western Lake Ontario harbours and port requirements in that region.

Wharves—Of some 3,500 public wharves, piers, breakwaters and other related harbour works under the administration of the Department, 490 wharfingers were employed to supervise these facilities. Gross wharf revenues totalled \$1,899,713, a decline of \$12,877 from last year, in line with the generally lower commercial marine traffic during the 1967 season.

The Government Wharves Regulations and tariff of charges apply at public wharves used for general and bulk cargoes, commercial fishing operations, ferry services and for recreational and tourist boating purposes.

The National Transportation Act passed by Parliament in 1967 embodied the general principle that where facilities and services are provided at public expense, the users should bear a fair proportion of the costs. The construction, maintenance and operation of the large number of public wharves of all types involve major public expenditures and the Government Wharves Regulations have for many years provided for the payment of user charges at reasonable levels.

Properties—Further progress was made in the continuing review and updating of property leases, including measures to bring rentals into line with current property values. Action was also taken to simplify administrative procedures and provide more efficient service in the issue of leases and renewals.

Under a general Order in Council, the Department has now been granted full authority to complete leasing arrangements for terms up to 20 years. A new agreement was negotiated with the Bell Telephone Company covering numerous power line crossings and other of their installations on the Rideau, Trent and Quebec canal systems. Under this agreement, simple permits will now be issued through District Canal offices and the practice of issuing formal licences for each individual installation has been discontinued.

Order in Council authority was obtained to transfer the administration and control of the Chausse Street dam at Valleyfield, water power and connected lands to the Province of Quebec, relieving the Department of future maintenance costs. Carillon and Grenville canals land and lands upstream of the Carillon power dam were also transferred to the Province of Quebec.

There are now 2,266 leases and other agreements in force and rental revenues from departmental marine properties, including Government Crown

properties under harbour commission administration, totalled \$931,524, an increase of \$225,085 over the previous year.

Marine Regulations

Of the 33 regulations in effect to provide for uniform enforcement of Parts II and VII of the Canada Shipping Act, 11 were amended either to conform with modern developments in the industry or to bring them into conformity with Inter-Governmental Maritime Consultative Organization amendments to the Safety of Life at Sea Convention 1960.

The handbooks of approved and registered diesel engines and reduction gears have been supplemented by the addition of 87 approved and registered designs of diesel engines and 22 reduction gears.

Conferences

The Department was represented at meetings held by the Canadian Standards Association, the Canadian Government Specifications Board, the Institute of Electrical and Electronic Engineers, and the American Society of Mechanical Engineers, Boiler and Pressure Vessel Committee. The Department also participated in 14 meetings of the Inter-Governmental Maritime Consultative Organization (IMCO) held in London, England, at various times during the year.

Marine Safety

Lifejackets—A new Department of Transport standard lifejacket, conforming to the International Convention on the Safety of Life at Sea 1960, was designed and tested and is now available for Canadian ships.

The research program initiated last year with the Canadian Red Cross to develop a more efficient lifejacket for children continued, testing stations were set up, and the information obtained is being evaluated.

Capacity Plates—Capacity plates issued recommending safe load and horsepower for certain categories of pleasure boats totalled 51,167, compared with 40,865 last year.

Safety Afloat—A new edition of the publication, *Safety Afloat*, was issued, and 345,000 copies were distributed to the boating public.

Water Pollution

Air patrols over the St. Lawrence River and Seaway System continued during the navigation season to check on pollution of the water by oil. There were 22 convictions for violations of the Oil Pollution Prevention Regulations.

Ship Inspections

Inspections of 1,869 Canadian registered ships, totalling 2,547,006 gross tons, were carried out. Of these, 454 were passenger ships totalling 276,240 gross tons. These inspections included 182 new ships built in Canada, 19 either converted or reconditioned, and 14 ships built outside Canada for registry in Canada.

Of 3,539 inspections of ships' cargo handling gear, 364 cases required repairs, adjustments or testing.

In addition, at the request of the St. Lawrence Seaway Authority, 78 inspections were made of ships reported to be damaged and their capability of making a safe passage through the Seaway was in doubt.

Marine Engineer Examinations

Candidates examined for certificates of competency as marine engineers totalled 1,375, an increase of over eight per cent from last year. Of these, 935 received certificates and 299 obtained partial passes. The increased demand for qualified marine engineers necessitated issuing 880 relaxations allowing individuals, not possessing the appropriate certificate, to act as engineers on ships—an increase of 14 per cent over the previous year.

Wave-Climate Study

The wave-climate study of the Great Lakes and Gulf of St. Lawrence, undertaken to provide information as a basis for revising the Great Lakes Load Line Rules, continued. Ten wave-recording stations were installed, completely encircling the Gulf of St. Lawrence. Weather towers for recording meteorological data were installed off the Magdalen Islands and on Superior Shoals in Lake Superior. CCGS *Skua* was seconded to the project and modified to accommodate the National Research Council field team. A small laboratory was constructed in the hold, providing continuous servicing of the wave-recording equipment as the ship sailed around the Gulf. High quality wave recordings were obtained for an overall coverage of 75 per cent of the time, considered a high percentage for such an extensive field survey. A preliminary analysis indicated that several stations in the Lower Gulf recorded ocean type waves. The taped data is being analysed by electronic computers for use by the Meteorological Branch in the hindcast program, which will produce substantiating statistics from historical weather data.

Using information and data derived from the study, two panels of the Joint Technical Committee for the Consideration of Great Lakes Load Lines have prepared tentative proposals for freeboards and for the strength of Great Lakes ships.

Marystown, Nfld.

A 1,000-ton lifting capacity marine haulout at Marystown, Nfld., was completed and handed over to the Province of Newfoundland for operation.

Air Cushion Vehicle Regulation

As the first step in transferring the responsibility for regulating air cushion vehicles from under the Aeronautics Act to the Canada Shipping Act, an air cushion vehicle officer joined the staff of the Marine Regulations Branch. At a later date it is intended to form within the Branch a separate Air Cushion Vehicle Division.

Ship Registration

During the year, 1,584 vessels were measured for tonnage by district measuring surveyors and the forms were checked by headquarters staff. The total for the previous year was 1,543.

Small vessels exempt from registration and licensed under the *Small Vessel Regulations* totalled 54,129, making a grand total of 727,341 such vessel licences issued throughout Canada up to December 31, 1967. During the same period, 1,514 vessels were added to the Canadian registry and 798 were removed, making a net increase of 716. At the end of December 1967, there were 26,451 vessels totalling 3,668,429 gross tons registered in Canada. The number and tonnage by Provinces were as follows:

<i>Province</i>	<i>No. of Ships</i>	<i>Gross Tonnage</i>
Newfoundland.....	1,040	163,044
Nova Scotia.....	7,579	201,696
Prince Edward Island.....	1,126	24,721
New Brunswick.....	2,703	151,014
Quebec.....	3,055	1,091,011
Ontario.....	2,579	1,100,931
Manitoba.....	109	19,465
Saskatchewan.....	1	108
Alberta.....	15	873
British Columbia.....	8,237	914,096
Yukon Territory.....	7	1,470
TOTAL.....	26,451	3,668,429

In accordance with the British Commonwealth Merchant Shipping Agreement, the Registrar General of Shipping and Seamen in the United Kingdom was supplied with particulars of ships registered during the year for use in compiling the *Mercantile Navy List and Maritime Directory*, which shows particulars of all vessels registered in the Commonwealth. Approximately 10,404 separate transactions involving first registry, re-registry, registry anew, transfers and transmissions of ownership, mortgages and changes of name, together with details of all vessels registered during this period, were supplied.

Port Wardens

Under the Canada Shipping Act, port wardens are appointed to administer regulations for the safe carriage of grain and timber deck cargoes and the stowage of concentrates. These cargoes are particularly liable to endanger a ship either because of their tendency to shift or otherwise affect the stability during a sea passage. Control measures include the requirements to calculate the stability of grain ships, to limit the height of deck cargoes of timber, and to dry concentrates to prevent their becoming fluid in transit.

The Canadian Concentrates Code published by the Nautical and Pilotage Division is to be superseded by the Canadian Bulk Cargoes Code. The new Code, basically the IMCO Code of Safe Practice for Bulk Cargoes, supplemented to make its application possible in Canada, will come into effect in June 1968.

Departmental officers act as port wardens in 13 ports and districts, and in eight ports and districts there are fees-of-office appointees. Separate acts provide for port wardens at Montreal and Quebec City.

A summary of port warden reports for the year ending December 31, 1967, follows:

<i>Port or Region</i>	<i>Grain</i>	<i>Vessels loaded with</i>	
		<i>Concentrates</i>	<i>Timber on Deck</i>
Vancouver, B.C.....	375	53	293
Victoria, B.C.....	34	2	101
Vancouver Island, B.C.....	8	14	250
Vancouver Island, North End, B.C.....	—	41	—
Vancouver Island, Central, B.C.....	8	14	121
New Westminster, B.C.....	26	19	98
Prince Rupert, B.C.....	18	43	34
Great Lakes.....	110	1	5
Churchill, Man.....	33	—	—
Lakehead, Ont.....	112	—	—
Montreal, P.Q.....	171	3	—
Quebec, P.Q.....	57	9	27
Sorel, P.Q.....	48	—	—
Trois Rivières, P.Q.....	49	4	—
Baie Comeau, P.Q.....	59	—	13
Port Cartier, P.Q.....	1	—	—
Dalhousie, N.B.....	—	17	1
Newcastle, N.B.....	—	3	6
Saint John, N.B.....	58	—	3
Halifax, N.S.....	30	1	1
St. John's, Nfld.....	3	6	39
TOTAL.....	1,200	230	992

Livestock Shipping Act

The department has one inspector of livestock shipments based at Montreal, but available at other shipping points as required. During the year 7,437 head of livestock were loaded at Montreal and 1,704 at Saint John, N.B. These shipments included cattle, horses, swine, two wapiti and one musk-ox.

Pilotage

There were 392 licensed pilots engaged in the nine districts for which the Minister is the pilotage authority—Sydney, Bras d'Or Lakes, Halifax, Saint John, Quebec, Montreal, Cornwall, British Columbia and Churchill.

They performed 35,798 pilotages inward or outward and 12,866 movages, grossing \$7,489,192.60 in fees.

Pilotage in three districts—District No. 1, Cornwall to Kingston; District No. 2, Port Weller to Sarnia; and District No. 3, the Lakehead and St. Mary's River—is carried out as a joint operation between Canadian and United States authorities.

Cornwall to Kingston—Twenty Canadian pilots performed 2,918 pilotages, netting \$332,102.58 in fees.

Port Weller to Sarnia—Forty-five pilots performed 3,142 pilotages, netting \$647,185.28 in fees.

The Lakehead and St. Mary's River—Four pilots employed to conduct ships through the St. Mary's River and into ports on Lakes Huron, Michigan and Superior netted \$55,458.45 in fees.

In addition to the pilots in these three districts, there were 11 pilots with limited registrations, seven of which were registered for Lake Ontario and four for Lakes Huron and Michigan.

Labrador—Two pilots were employed by the Department to assist ships in and out of Goose Bay when required.

Royal Commission on Pilotage

The report of this Commission is still under preparation.

Marine Casualties

Preliminary inquiries into shipping casualties totalled 46, there were three formal investigations, and one formal investigation appeal. In addition, there were two inquiries under pilotage by-laws.

Masters, Mates and Seamen

At 107 Canadian ports 45,498 seamen were engaged to serve in ships of Canadian registry and 44,418 were discharged. Assistance was given in the settlement of estates of 20 seamen who died while in the service of ships registered in Canada and elsewhere.

During the year, 3,752 nautical examinations were held, and a total of 3,380 certificates of competency, service and efficiency were issued.

On January 1, 1968, an amendment to the Canada Shipping Act was proclaimed which requires the provision of certificated masters, and in some cases certificated mates, in fishing vessels exceeding 100 tons gross tonnage.

Marine Hydraulics

Hydraulics Studies—The feasibility of providing 45-foot deep approach channels to the port of Quebec is being studied and a joint engineering-economic report is scheduled for June 1969.

Hydraulic model studies under contract at Lasalle is a continuing activity essential in hydraulic engineering analyses and research related to navigation improvements. The Montreal to Quebec section of the St. Lawrence River tidal model at the National Research Council has been completed and is now in operation. With the extension to the NRC's hydraulic laboratory now completed, construction of the section of the model between Quebec and Father Point will proceed, and the full tidal model from Montreal to the sea is expected to be finished and in operation about the end of September 1968.

The Department continued to participate in the activities of the International Joint Commission (IJC) which concern commercial navigation in the Great

Lakes-St. Lawrence River system. The Department's involvement in Lake Ontario regulation continued through its membership on the International St. Lawrence River Board of Control and its Operations Advisory Group, and in the IJC's investigation of the feasibility of further regulating the Great Lakes through its Board, Committee and Sub-Committee memberships. Contributory projects for the IJC completed during the year included studies of stage-discharge relationships in the River below Montreal and future water requirements for navigation through the locks in the connecting channels of the Great Lakes system.

St. Lawrence Ship Channel—For EXPO 67, a pleasure craft channel was made available from Lanoraie to the marina at La Ronde to keep such craft away from the main channel.

During the early part of the 1967 navigation season, Montreal Harbour water levels were five to six feet over chart datum. They began to drop towards the end of May, but remained about two feet over datum on to the end of July. This was maintained because of substantially higher than normal Ottawa River spring discharges. Throughout August and September, levels remained above one foot over datum. Thereafter, a fairly rapid rise developed to five feet over datum by the beginning of November, reaching a maximum of six feet nine inches in mid-November. Levels of five feet over datum persisted till the end of the season.

During the whole season, very few levels were published below one foot over chart datum, the only exceptions being five days during September, the lowest of which was eight inches over chart datum.

At the end of the season the 800-foot minimum channel width was opened from buoy 82M Vercheres curve to buoy 151M Pointe-aux-Trembles curve. The Pointe-au-Trembles channel widening was delayed by the oil pipeline crossing, but the additional width should be available by July 1968. The turning basin on the port side of Pointe-aux-Trembles channel between buoys 151 M and 157 M is also expected to be available about the same time.

Work started on the emergency anchorage on the port side of the Vercheres-Contrecoeur channel between buoys 57 M and 77 M had to be stopped because the dredging operation was soiling the domestic water intake of the town of Contrecoeur. The town is expected to install a filtration plant this winter, which will permit the completion of the anchorage in 1968.

Removal of the shoal between the two channels at Trois Rivières progressed and should be completed by 1970.

In the Saguenay River, the work in the St. Fulgence to Chicoutimi Channel has been completed. The limiting depth is 20 feet at lowest normal tides and the channel has been widened to 400 feet from buoy 22 S to Chicoutimi. The basin has been deepened to 30 feet lowest normal tides. A complete revision of floating aids is under consideration for the opening of navigation 1968.

During 1967 work started in the south channel below Quebec but was hampered by difficulty with the long pipeline required for the disposal of the dredged material. This part of the equipment will be completely redesigned and the project resumed in 1968.

At East Narrows at the lower end of St. Michel-Brulé Bank range, at Cap Brulé range and at Longue Pointe ledge at Cap Gribane, the depth of 30 feet lowest normal tides was restored.

St. Lawrence Ship Channel, Contract Dredging Details, Season 1967

Locality	Cu. Yds. Removed Pl. Meas.	Cost	Material	Nature of Work	Extent of Completion (Cost Basis)
<i>1965 Contract—CAPITAL</i>					
Item A Pointe-aux-Trembles.....	18,156	39,580.08	Shale, hardpan, some clay	Widening	100%
Item B, C Pointe-aux-Trembles.....	722,663	361,331.50	Clay, gravel, stones, boulders	Widening	100%
Item D, E Île-aux-Vaches—Île Ste. Thérèse.....	1,268,674	634,337.00	Clay, stones, boulders	Widening	100%
Item F Varennes.....	2,902	3,656.52	Hardpan, stones, boulders	Widening	100%
Item G Île Deslauriers.....	1,151,514	575,757.00	Clay, stones, boulders	Widening	100%
Item H, I, J Cap St. Michel—Verchères..	643,887	321,943.50	Clay, stones, some gravel	Widening	100%
Item K Verchères.....	781,724	390,862.00	Clay, stones	Widening	100%
	4,589,520	\$2,327,467.60			
<i>1967 Contract—CAPITAL</i>					
Pointe-aux-Trembles Anchorage.....	2,694,750	\$2,600,433.75	Clay, some gravel, stones, boulders	Anchorage	94%
<i>1967 Contract—CAPITAL</i>					
Trois-Rivières Shoal.....	1,436,574	\$3,476,509.08	Hardpan, stones, boulders, some clay	Removal of shoal	44%
<i>1967 Contract—CAPITAL</i>					
South Channel below Quebec.....	133,928	\$ 186,159.92	Hardpan, clay, stones, boulders	Deepening	10%
<i>1967 Contract—CAPITAL</i>					
Contrecoeur.....	235,000	\$ 260,850.00	Clay, stones, boulders	Emergency Anchorage	27%
<i>1967 Contract—CAPITAL</i>					
Lake St. Louis.....	3,695	\$ 103,460.00	Hardpan, stones, boulders	Widening	100%
<i>1967 Contract—CAPITAL</i>					
Lake St. Francis.....	170,887	\$ 163,021.46	Gravel, stones, boulders	Widening	100%
<i>1967 Contract—MAINTENANCE</i>					
Below Montreal.....	180,660	\$ 366,739.80			100%
Above Montreal.....	12,815	\$ 26,911.50			100%

Channel depths were restored at Lancaster Bar, Clark Island Curve and at the west approach to Iroquois Lock.

Dredging to provide a minimum width of 600 feet on Lake St. Louis was completed.

Combined study of the tidal behaviour of the St. Lawrence River, measurements of river flows, water levels, and salinity were made in the Quebec-Ile aux Coudres reach, in connection with departmental commitments associated with the National Research Council, the Departments of Energy, Mines and Resources and Public Works.

For the program of evaluating the effects of proposed Great Lakes regulation plans on downstream interests as part of the International Great Lakes water levels study, a basic data inventory of shore property investigation for the St. Lawrence River between Montreal and Trois Rivières was completed and issued.

In the ice abatement program on Lake St. Peter, four experimental islands were partially constructed during 1967 and will be topped-off during 1968. Within the continuing objective throughout the winter to retain the ice along both sides of the channel and prevent large ice sheets from shifting into and blocking the channel, the present program of experimental islands is designed to determine by actual performance, the types of works which will achieve the desired effects at minimum cost. During the winter, studies of ship-generated wave effects on the break-up of ice covers were commenced. Factors involved include ship speed, ship dimensions, proximity of ship to ice cover edge, strength of ice, and depth of water. Anticipated advantages include prevention of large cakes of ice from breaking off and fouling the channel, reduction of icebreaker work, and minimizing open water area with consequent reduction of new ice formation.

Another study is under way to determine the behaviour of ships in restricted channels, particularly their squat characteristics. The purpose of this study is to define, for various reaches of the river, the under-keel allowance that will be included in the establishment of new channel depth design criteria. In 1968-69 observations will continue to be taken in a shallower channel in Lake St. Peter. This channel is 35 feet deep and 550 feet wide through a lake generally about eight feet deep and seven miles wide. Observations of ship-generated waves will be taken at the same time as squat measurements.

An ice control structure achieved complete ice cover on Laprairie Basin on January 26 and was cleared of ice on April 3.

The four experimental ice booms installed on the northeast side of the channel on Lake St. Peter were very effective in forming an early ice cover and in ice retainment, although they suffered damage and some modifications in design will be made for the 1968-69 season. No more booms are planned until the effect of spoil disposal in the 800 feet widening of Lake St. Peter is studied.

Marine Traffic Control—On April 3, the Marine Traffic Control system in the St. Lawrence came into effect with two control centres, one in Quebec and the other in Montreal. The Quebec control centre, operating with departmental personnel, had surveillance over the waters from immediately east of the pilotage boarding area at Les Escoumins to Tracy, and was divided into three sectors. The fourth sector, from Tracy to the upper limits of Montreal Harbour, was controlled from the National Harbours Board office in Montreal.

Each ship transiting the system reported in at pre-determined reporting points and was informed by the control centre of the traffic she would encounter,

navigational hazards and prevailing weather conditions. For ships not yet fitted with their own VHF equipment, portable sets were made available at a nominal rental fee. During the winter months, the ice information officer was located in the Quebec control centre to ensure rapid transmission of ice conditions between Sept-Îles and Montreal to ships in transit in that area.

On January 1, 1968, the former Pilotage Signal Service was incorporated into the Marine Traffic Control Division and an information centre was organized to receive, catalogue, display and disseminate the intelligence received from the control centres for the despatch of pilots, ship owners, agents and operators as well as enquiries from the general public.

Plans are under way to use high speed data processing methods to increase the efficiency of both the control and information centres.

There were no collision casualties in the controlled waters.

Canadian Coast Guard

Two new ships were added to the fleet and three were withdrawn during the year. CCGS *Quadra*, a new Pacific weathership was commissioned, replacing the CCGS *Stonetown*. CCGS *J. E. Bernier*, a light icebreaker, lighthouse and buoy tender, replaced the *Saurel* and *Chesterfield*.

At the end of the year under review, the fleet consisted of over 200 craft. These included nine full icebreakers, one icebreaking cable repair ship, nine light icebreakers, one special Arctic service vessel, 13 lighthouse supply and buoy vessels, six Northern supply vessels, six St. Lawrence Ship Channel including marine traffic control craft, two weatherships, one lightship, one Great Lakes limnology and meteorological research vessel, 15 search and rescue cutters and lifeboats, 65 Northern operations shallow draft landing craft, four Mackenzie River buoy vessels, and eight Marine Agency tenders. The Department also operated 60 pilotage and canals craft.

Northern Operations—The annual Arctic resupply operations delivered 108,000 short tons of dry cargo and bulk oil to approximately 70 ports of call.

Existing aids to navigation in the Eastern and Western Arctic were serviced, some new ones were established and direction finding stations were calibrated.

CCGS *C. D. Howe* carried out her eighteenth annual Eastern Arctic Patrol. Officials of the Departments of National Health and Welfare and Indian Affairs and Northern Development were on board, bringing medico-dental and other services to the many settlements visited.

A particularly interesting assignment was carried out by the CCGS *John A. Macdonald*. Unusually severe conditions in the Western Arctic required additional icebreaker support for the Northern Transportation Company's vessels operating eastward from Tuktoyaktuk in order to complete the summer resupply work. The *Macdonald*, which was supporting the Resolute convoy in the Eastern Arctic, was assigned to the task. To avoid delays in the severe ice conditions of Viscount Melville Sound and Prince of Wales Strait, which was the only explored route for a vessel of this size between the Eastern and Western Arctic, it was decided to attempt a passage through Victoria Strait. The first known transit of this Strait had been made in the previous year by CCGS *Camsell*, which had established that at least in one area there was sufficient water for the *Macdonald's* draft over the whole route. The *Macdonald* made the passage in relatively easy ice conditions and found even greater depths than the *Camsell*.

After completing the Western Arctic resupply mission, a request was received from the United States Coast Guard for the *Macdonald* to assist in freeing the United States icebreaker *Northwind* which had been damaged in the polar pack north of Alaska. After considerable difficulty in very severe ice conditions, the *Macdonald* reached and extricated the *Northwind* and escorted her south to open water. By then, the season was so advanced that the *Macdonald* was obliged to return to her base at Dartmouth, N.S., via the Panama Canal.

Hudson Bay Route—During the 1967 navigation season, 33 ships, slightly less than the previous few years, used the Hudson Bay route to load grain at Churchill, Man., a number of these bringing general cargo inward. The first vessel arrived at Churchill on July 29 and the last sailed on October 19. An ice information office was established at Churchill to provide information on ice conditions to ships on the route, to advise on the best track to follow, and to co-ordinate icebreaker support to merchant ships as required.

Winter Icebreaking—Ice and weather conditions during the winter shipping season in the Gulf and Lower St. Lawrence were average, and no abnormal problems were encountered. Again there was an increase in the volume of cargo moved in this area, with a total of approximately 8.4 million tons compared with 7.9 million tons last year.

Support of shipping by the Department consisted of air reconnaissance of ice conditions, analysis of reports from all sources and ice forecasting at the departmental ice central office in Halifax, provision of information on ice conditions and advice on routes to be followed, through ice information offices at St. John's, Nfld., Sydney, N.S., and Quebec, P.Q., and providing icebreaker support where needed.

In the St. Lawrence between Quebec and Montreal, flood control icebreaking was carried out starting early in January and ending early in April. The early part of the season was particularly difficult. An exceptionally cold spell at the beginning of January with sustained very low temperatures for several days and generally unfavourable weather conditions resulted in the formation of ice jams in various parts of the river, particularly in the key areas of Lake St. Peter and above Quebec, that were so severe that the icebreakers could not remove them quickly enough. The one at Quebec was particularly difficult and it was not until heavy icebreakers had been diverted from their normal work lower down that this jam was removed. During this period, which lasted from mid-January to early February, water levels rose to considerable heights and some low-lying areas were most unfortunately inundated.

Requests were received for ships to proceed up the Saguenay River and icebreaker support was given to 14 vessels to Port Alfred and back.

Lake Melville Winter Probe—An experimental probe was again carried out by CCGS *John A. Macdonald* on May 3, 1967, into the western waters of Lake Melville. The purpose was to gain further data in determining the number of months a year this inland waterway to Goose Bay could be kept open for shipping with icebreaker assistance. On that date, the *Macdonald* had to contend with ice up to four feet in thickness with heavy ridging in the Goose Bay Narrows area.

Scientific Operations—The main scientific work during the 1967 Arctic season was made by the major icebreakers, CCGS *Labrador*, *John A. Macdonald*,

and *d'Iberville*, which carried hydrographers, oceanographers and other scientists and were able to undertake much valuable survey and scientific work in conjunction with their icebreaking and resupply duties.

The Victoria based *Camsell* carried out hydrographic surveys in the Western Arctic. Her work there, however, was reduced somewhat because of severe ice conditions.

CCGS *Sir Humphrey Gilbert*, *Narwhal*, and *Wolfe* assisted in carrying out hydrographic, geophysics, wave and other studies in the Lower St. Lawrence, Gulf and East Coast areas.

CCGS *Porte Dauphine*, based at Toronto, continued to be operated on behalf of the Meteorological Branch and Great Lakes Institute (University of Toronto). Scientific studies and special observations were made by this vessel on all the Great Lakes in addition to the full-time normal synoptic program.

Weatherships—Station *Papa*, located in the Pacific Ocean approximately 1,000 miles from Vancouver, is now manned by two new weatherships, CCGS *Vancouver* and CCGS *Quadra*, replacing the *Stonetown* and *St. Catharines*.

Icebreaking Cable Repair Vessel—CCGS *John Cabot* is under charter to the Canadian Overseas Telecommunication Corporation for cable repair work and is mainly employed along the eastern Canadian seaboard.

In July 1967 the ship successfully completed trials of a new device for cutting a furrow in the sea bed and burying communications cable so that it cannot be caught and damaged by fishing nets and trawls. Her relatively high power for her size makes her particularly suitable for this operation and it is expected that she will be used extensively in this capacity.

Search and Rescue—Under the overall administration of the Air Branch of the Canadian Armed Forces, Coast Guard Rescue officers attached to the Rescue Co-ordination Centres at Halifax, N.S., Trenton, Ont., and Vancouver, B.C., control the operations of the Coast Guard Rescue cutters and provide the marine liaison for the search and rescue organization. Close liaison is also maintained with the public concerning the various aspects of water safety, with the commercial fishing industry and, in particular, the pleasure boating public.

Canadian Coast Guard units participated fully and exclusively in 781 incidents—West Coast, 433; Great Lakes, 88; and East Coast, 260.

Training—The Canadian Coast Guard College, at Point Edward, N.S., started its third year in September 1967 with an enrolment of 45 additional cadets.

Twenty scholarships were awarded to selected deck and engineer officers to study for higher grade qualifications, and two senior Coast Guard masters attended management seminars at Mont Gabriel, P.Q.

Approximately 50 Coast Guard officers and men were awarded first aid certificates during the year, 33 of which were Coast Guard College cadets.

The Navy continued to give fire fighting and damage control courses at Halifax and Esquimalt and to train West Coast Coast Guard personnel in scuba diving. Arrangements were completed for the Navy to give this training at Halifax.

Ten officers attended a three-week radar navigation course given by the Navy at Halifax.

Twenty Coast Guard engineers attended an electrical maintenance course at the Canadian Westinghouse Plant, Moncton, N.B., in January, 1967. Some twenty Coast Guard engineers attended a course in digital boiler control systems given by the Bailey Meter Company of Cleveland, Ohio, from August 21 to September 1. Courses on gas turbines at Canadian Westinghouse, Hamilton, Ont., are being arranged.

Ship Construction

During the fiscal year five vessels were completed, 11 were under construction, one was undergoing a major conversion and 13 were in the design stage.

One vessel was completed for the Canadian Coast Guard fleet, the icebreaking supply and buoy vessel, *J. E. Bernier*, for service at Quebec. Vessels under construction for the fleet were: triple screw icebreaker *Louis S. St-Laurent* for service in the Maritimes and Northern areas; icebreaking supply and buoy vessel *Norman McLeod Rogers* for service in the Newfoundland and Gulf of St. Lawrence areas; supply and buoy vessel *Tracy* for service at Sorel, P.Q.; search and rescue cutter No. 1 for service on the East Coast; supply and buoy vessel replacement for CCGS *Grenville* for service at Prescott, Ont.; supply and buoy vessel replacement for CCGS *Brant* for service at Dartmouth, N.S.; supply and buoy vessel replacement for CCGS *Sea Beacon* for service at St. John's, Nfld.; river tender for Saint John, N.B.; survey/workboat *Jean Bourdon* for St. Lawrence Ship Channel service.

In the design stage were three vessels to replace CCGS *Estevan*, *Detector*, and *N.B. McLean* in addition to a tender for Amherstberg, Ont.; three supply vessels for Northern operations; five 44-foot shore-based lifeboats, three for service on the West Coast and two on the East Coast; and one 60-foot buoy tender for Sorel, P.Q.

Vessels completed for operation by other agencies with construction funds provided in departmental estimates totalled four. These were: ferry vessel M/V *Ambrose Shea* for CNR service between Nova Scotia and the east coast of Newfoundland (Argentia); ferry vessel M/V *Frederick Carter* for CNR service between North Sydney, N.S., and Port aux Basques, Nfld.; two pilot vessels for pilotage service, *Canada Pilot No. 2* for service at St. John's, Nfld., and *Canada Pilot No. 4* for service at Sydney, N.S.

One ferry vessel M/V *John Hamilton Gray* for CNR Prince Edward Island service was under construction. The ferry vessel M/V *Patrick Morris* for CNR service between North Sydney, N.S. and Port aux Basques, Nfld., was undergoing major conversion. One fisheries protection vessel *Tanu* for service in the West Coast was under construction, the funds being provided by the Department of Fisheries.

Miscellaneous—Various small vessels for the Department have been delivered or are under construction.

Repairs—Under the supervision of the Ship Construction Branch, repairs totalling approximately \$4,115,000 were carried out on Canadian Coast Guard ships, and alterations and additions expenditures totalled some \$1,525,000.

TRANSPORTATION POLICY AND RESEARCH

The Transportation Policy and Research Branch was formed during 1965-66 by the amalgamation of the Railway and Highway Branch and Economic Studies Branch. It was formed to undertake economic and technical research into all modes and forms of transportation; to assist in the development and formulation of transportation policies; and to advise on legislation in all fields of transportation. The Branch is staffed by a group of professionals with training in the fields of economics, statistics, commerce, geography, business administration and engineering, with experience in railway, shipping, trucking and airline companies.

The Branch also has responsibility for the control and audit of expenditures undertaken by Canadian National Railways on behalf of the Federal Government, such as ferry operations and railway construction. Responsibility has also been assigned for financial audits on ferry operations subsidized by the Canadian Maritime Commission. Expert advice is also provided on various financial matters such as loans and advances to Crown Corporations responsible to the Minister, CNR pension funds, and railway subsidies in general.

Some 50 research projects were undertaken during the past year, some of which are still underway and 10 projects were undertaken for the Department by consultants.

Railway Services

Canadian National Railways—Canadian National Railways operated at a deficit of \$35,869,197 in the calendar year 1967, compared with a deficit of \$24,593,217 the previous year.

Air Canada—Air Canada operated at a profit of \$3,547,320 in 1967, compared with a profit of \$2,909,878 in 1966.

Prince Edward Island Ferry and Terminals—The deficit in the operations of this service for the calendar year 1967 amounted to \$4,788,408, compared with \$4,550,968 for 1966, an increase of \$237,440.

In the fiscal year 1967-68, payments made on ferry construction for this service amounted to \$3,992,215, and dock construction totalled \$67,253 for Borden and \$35,320 for Cape Tormentine.

Vehicle traffic increased 5.5 per cent from 281,405 in 1966 to 296,858 in 1967. Freight decreased from 733,733 tons in 1966 to 732,587 tons in 1967, and passengers increased from 679,603 in 1966 to 726,735 in 1967.

Newfoundland Ferry Service—In addition to the regular North Sydney-Port aux Basques service, a freight service only is operated from North Sydney to various other Newfoundland ports as required by traffic conditions. In 1964 construction started on the terminal requirements and vessel for a new vehicle and passenger service to operate to Argentia, Nfld. A new rail car service between

North Sydney and Port aux Basques began operating early in 1968 and the North Sydney-Argentia service is planned for operation in mid-1968.

The deficit in the operation of this service amounted to \$16,527,170 in 1967, compared with \$12,998,939 for 1966, an increase of \$3,528,231.

Yarmouth, N.S.-Bar Harbor, Me., Ferry Service—Traffic handled during 1967 by this service consisted of 83,278 passengers, 24,131 cars, 3,273 cars and 1,572 other vehicles, compared with 94,490 passengers, 27,338 cars, 3,282 trucks and 1,334 other vehicles in 1966.

Maritime Freight Rates Act—Payments made under this Act during 1967-68 amounted to \$14,180,770 compared with \$14,335,158 the previous year, a decrease of \$154,388.

Supplemental Pension Allowances—Supplemental pension allowances payable by the Government of Canada to retired former Newfoundland railway, steamship and telecommunication employees transferred to Canadian National Railways amounted to \$310,956 compared with \$264,000 for the same period last year.

Victoria Jubilee Bridge—In 1967 the operating costs of this bridge totalled \$872,666 compared with \$841,421 in 1966.

Great Slave Lake Railway—Approximately 430 miles in length, this line extends from Grimshaw, Alta., to Hay River, N.W.T., a distance of 377 miles, with a branch to Pine Point Mines, a further distance of 53 miles. Completion is expected by March 31, 1970. Accountable advances for 1967-68 amounted to \$4,375,000, bringing the total advance to date to \$73,926,000.

Employees Provident Fund—Deficit—During the fiscal year, Cabinet approved the take over of responsibility for the provident fund deficit from Canadian National Railways. This annual deficit of some \$7,000,000 formerly showed up in the deficit of Canadian National Railways.

In the period under review, the deficit amounted to \$6,581,149.41.

FINANCIAL SUMMARY

Comparative Summary of Expenditures and Revenues for the Fiscal Years Ended March 31, 1967 and 1968

	<i>Millions of Dollars</i>		
	<i>1967-68</i>	<i>1966-67</i>	<i>Increase (+) or Decrease (-)</i>
<i>Administration, Operation and Maintenance Expenditures</i>			
Departmental Administration.....	6.5	5.6	.9 (+)
Air Services.....	129.1	113.0	16.1 (+)
Marine Services.....	55.1	50.6	4.5 (+)
Railway and Steamship Services.....	84.2	59.6	24.6 (+)
Boards, Commissions, and the St. Lawrence Seaway.....	167.5	198.8	31.3 (-)
General.....	.3	.3	—
	442.7	427.9	14.8 (+)
<i>Capital Expenditures</i>			
Departmental Administration.....	.3	.4	.1 (-)
Air Services.....	45.9	52.0	6.1 (-)
Marine Services.....	46.3	49.4	3.1 (-)
Railway and Steamship Services.....	24.5	27.3	2.8 (-)
	117.0	129.1	12.1 (-)
TOTAL DEPARTMENTAL EXPENDITURES.....	559.7	557.0	2.7 (+)
<i>Revenues</i>			
Departmental Administration.....	.1	—	.1 (+)
Air Services.....	38.8	32.0	6.8 (+)
Marine Services.....	9.3	7.6	1.7 (+)
Railways and Steamship Services.....	.4	.5	.1 (-)
Boards, Commissions, and the St. Lawrence Seaway.....	11.1	13.9	2.8 (-)
TOTAL DEPARTMENTAL REVENUES.....	59.7	54.0	5.7 (+)
NET DEPARTMENTAL EXPENDITURES.....	500.0	503.0	3.0 (-)

EXPLANATION OF INCREASES AND DECREASES

Administration, Operation and Maintenance Expenditures

Departmental Administration—The increase in expenditures of \$.9 million over the preceding year was due mainly to increased payroll costs and to additional studies in the field of transportation research.

Air Services—Expenditures this year were up \$16.1 million over 1966-67, attributable chiefly to salary and personnel increases in all areas. Apart from payroll items, airports and field operations costs were higher because of the takeover of facilities at Goose Bay, Nfld., and Calgary, Alta., as well as Expo commitments. Civil Aviation expenditures were up resulting from maintenance requirements on an additional JetStar aircraft and an unforeseen Viscount aircraft overhaul. Radio Aids expenditures increased by \$3.8 million, partly accounted for by a major termination charge for leased lines that were no longer required.

Marine Services—Expanded operations and the inflationary spiral in salaries and in material costs contributed chiefly to the overall increase of \$4.5 million from 1966-67. Marine Operations Branch was affected by the increased cost of weathership operations with the replacement vessels CCGS *Quadra* and *Vancouver*. Marine Works Branch expenses were higher by \$1.6 million.

Railway and Steamship Services—Expenditures this year were \$24.6 million higher than the previous year, for which the CNR deficit accounted for \$11.2 million and the Newfoundland ferry and terminals deficit contributed \$3.5 million. The Great Slave Lake railway subsidy increased by \$3.1 million due to the necessity of re-laying heavier rails than originally planned. Responsibility for the Employees Provident Fund deficit was assumed by this Branch in 1967-68, the deficit totalling \$6.6 million.

Boards, Commissions, and the St. Lawrence Seaway Authority—Expenditures were reduced from the previous year by \$31.3 million brought about by the transfer of the shipbuilding subsidy from the Department of Transport to the Department of Industry, and no further payments for the maintenance of Canadian Pacific and Canadian National railways trackage. An offsetting factor was the increase in payments under the Freight Rates Reduction Act of \$10.4 million.

Capital Expenditures

Air Services—The decline in capital investment this year of \$6.1 million compared to 1966-67 was brought about by reduced expenditures at Vancouver International terminal and Sydney, N.S., airport. The bulk of these programs was completed during the past fiscal year.

Marine Services—Capital expenditures this year were down \$3.1 million from 1966-67 to compensate for the rapidly increasing cost of operations. The only

branch with higher costs was Marine Hydraulics because of \$1.2 million spent on tidal hydraulics investigation, \$700,000 for experimental ice booms in the St. Lawrence, and \$3.9 million for dredging, including the removal of a shoal at Trois-Rivières.

Railway and Steamship Services—Investment expenditures at \$24.5 million were \$2.8 million less than in the preceding year, resulting from program completion of some ferries offset partly by greater expenditures for terminals on the Newfoundland run.

Revenues

Air Services—Airports and Field Operations Branch contributed \$32.8 million this year or \$6.5 million more than in 1966-67, chiefly because of increased air travel partly to Expo 67. This Branch alone accounts for 54.8 per cent of the Department's total revenue. Telecommunications and Electronics Branch revenues were up \$400,000 mainly because of an increase in the number of licences issued.

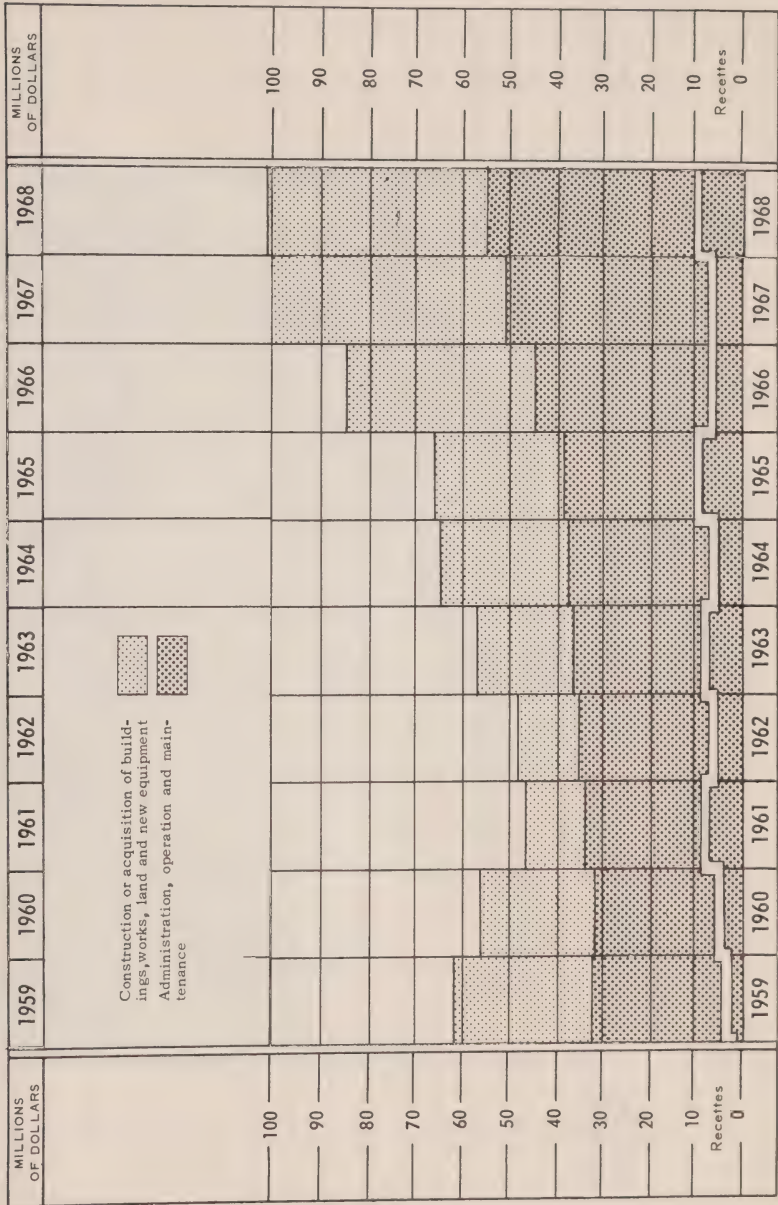
Marine Services—Revenues this year at \$9.3 million were up \$1.7 million from a year ago, reflecting income earned in 1966-67, but paid in the current year as well as the continued charter of CCGS *John Cabot* to the Canadian Overseas Telecommunication Corporation for cable laying and repair purposes.

Boards, Commissions, St. Lawrence Seaway Authority—Interest paid by the St. Lawrence Seaway Authority was \$2.9 million less than in 1966-67, partly compensated for by a gain of \$100,000 from the Toronto Harbour Commission.

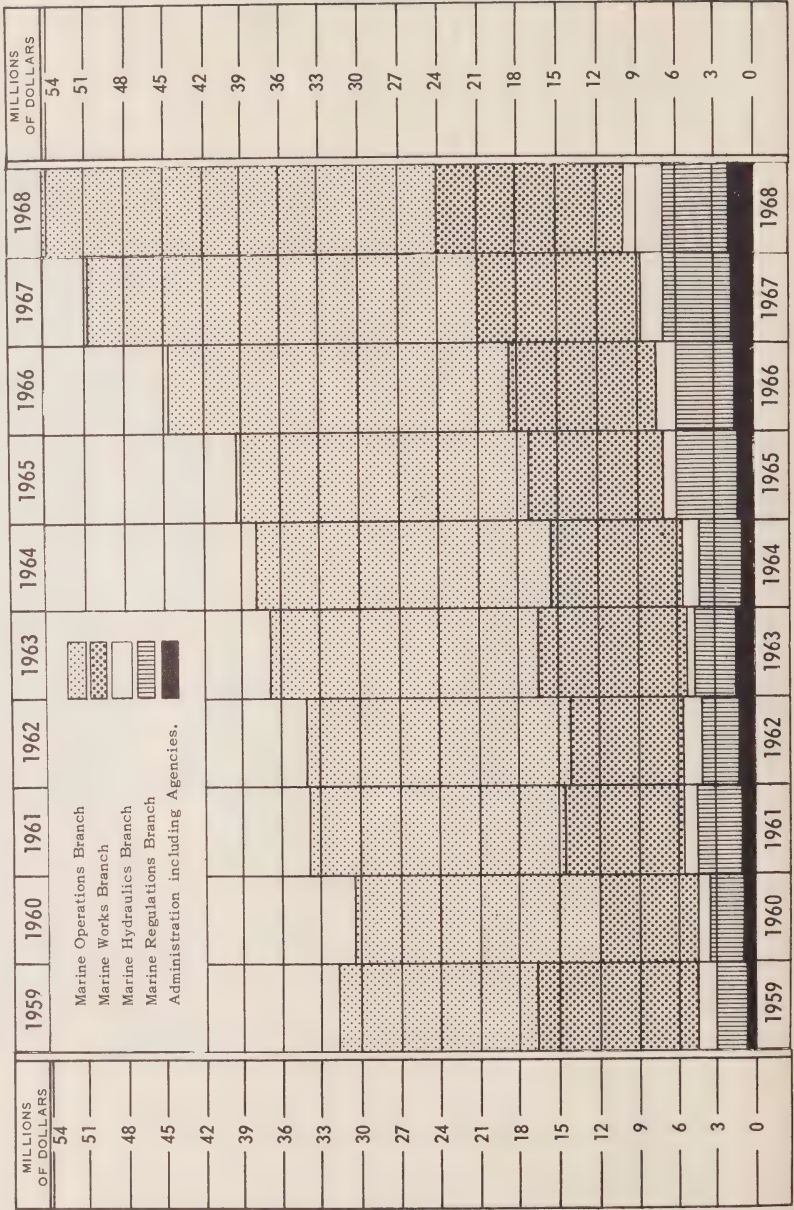
DEPARTMENT OF TRANSPORT

MARINE SERVICES

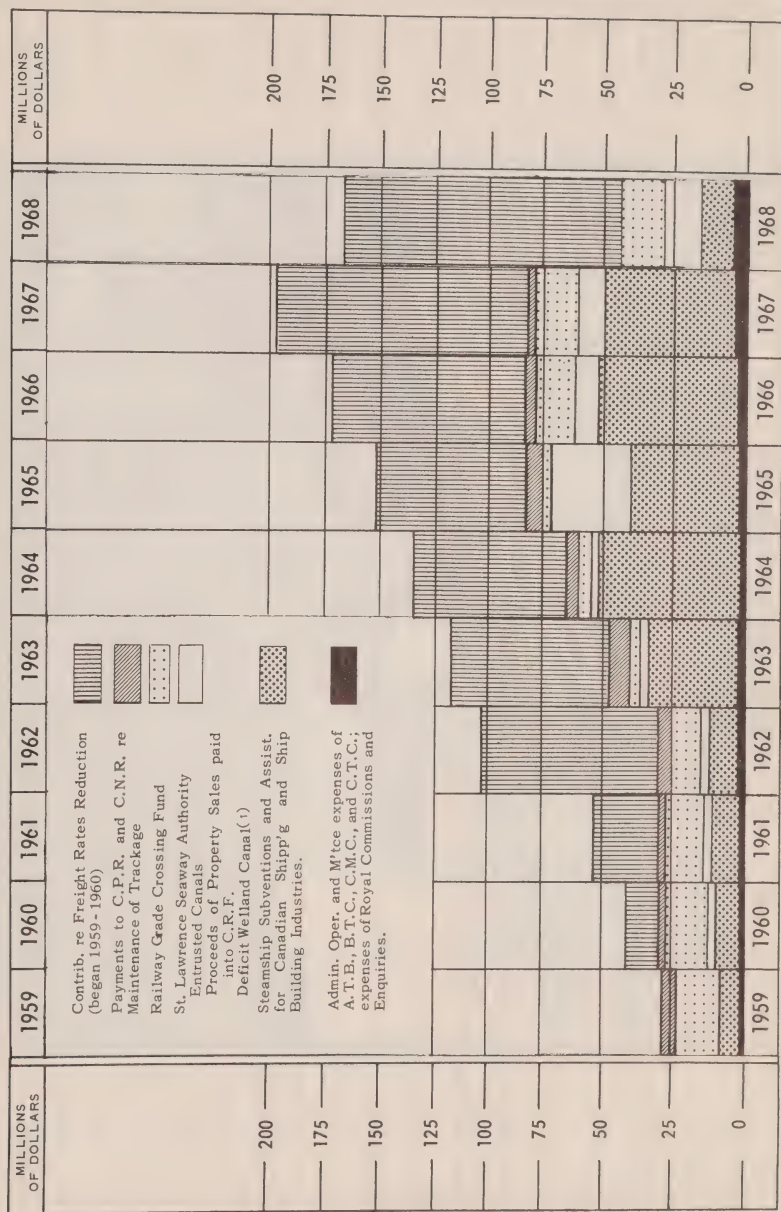
EXPENDITURES AND REVENUES FOR THE FISCAL YEARS 1958-59 TO 1967-68 INCLUSIVE



DEPARTMENT OF TRANSPORT
MARINE SERVICES-ADMINISTRATION OPERATION AND MAINTENANCE EXPENDITURES
FOR THE FISCAL YEARS 1958-59 TO 1967-68 INCLUSIVE

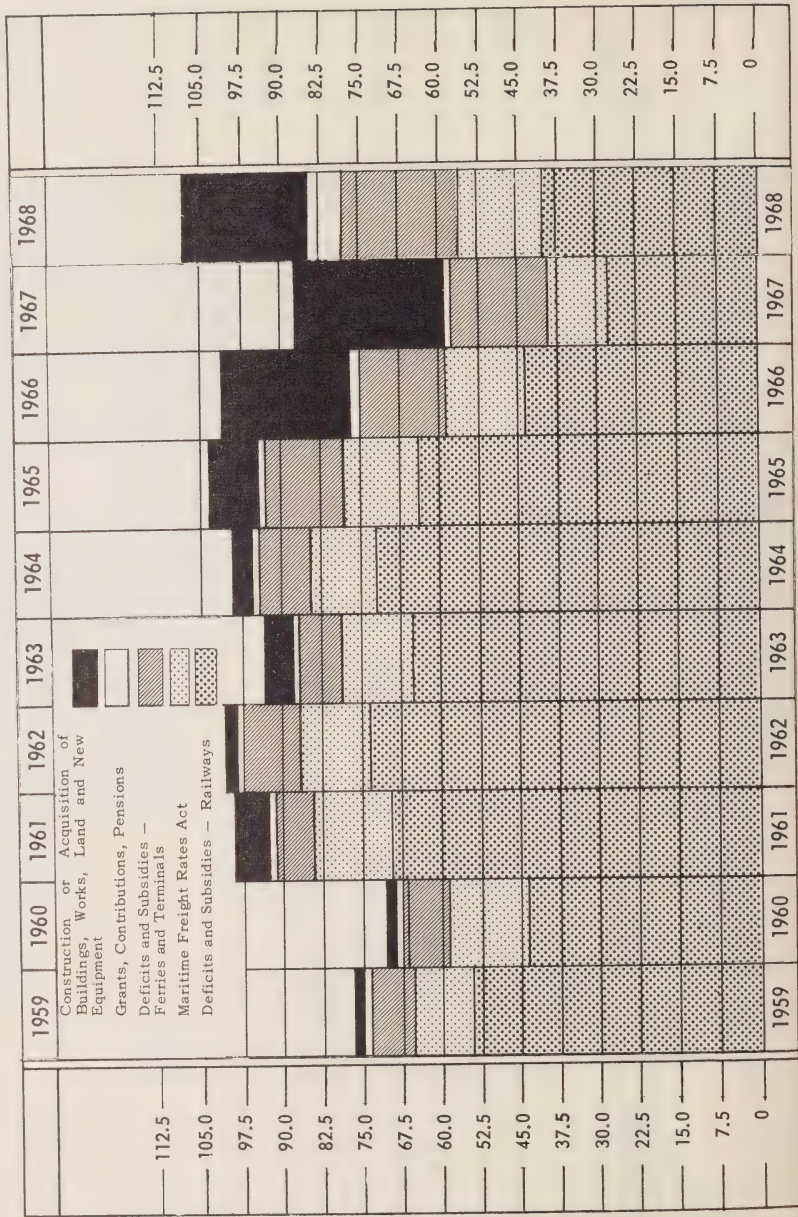


DEPARTMENT OF TRANSPORT

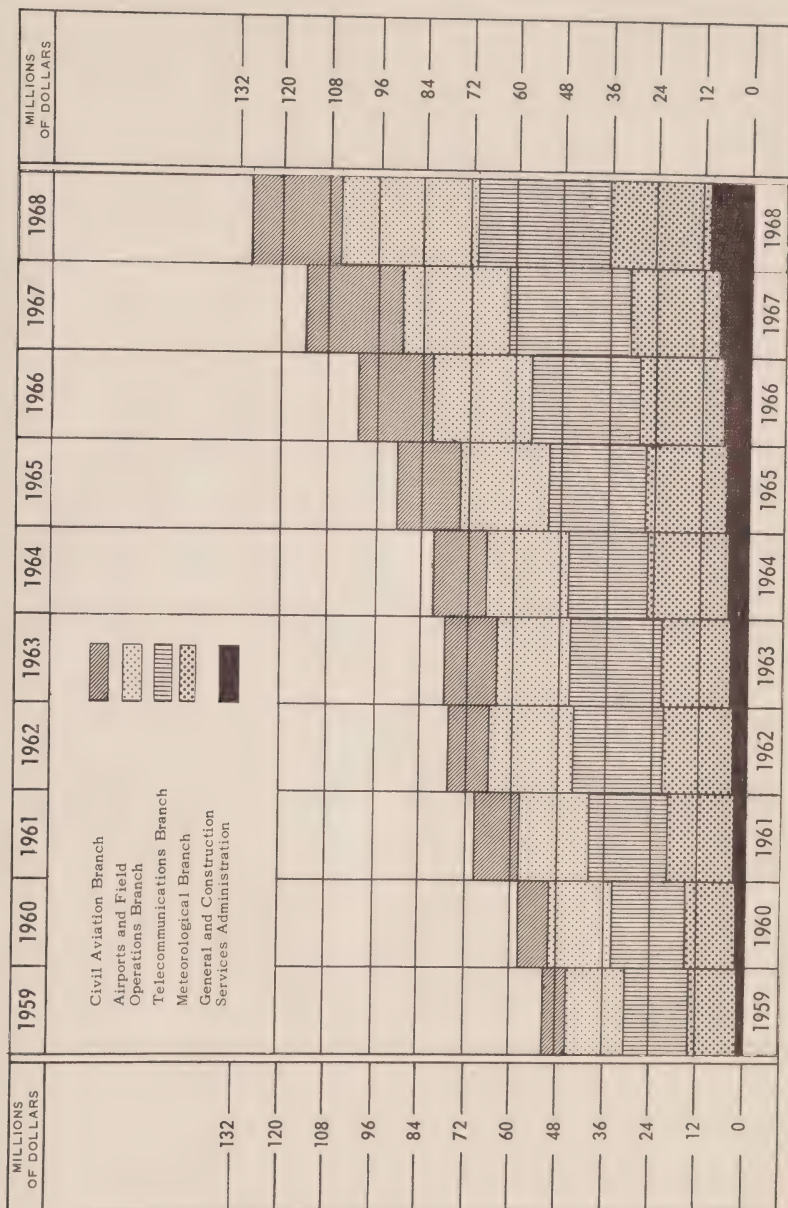
BOARDS, COMMISSIONS, ST. LAWRENCE SEAWAY AUTHORITY
EXPENDITURES FOR THE FISCAL YEARS 1958-59 TO 1967-68 INCLUSIVE

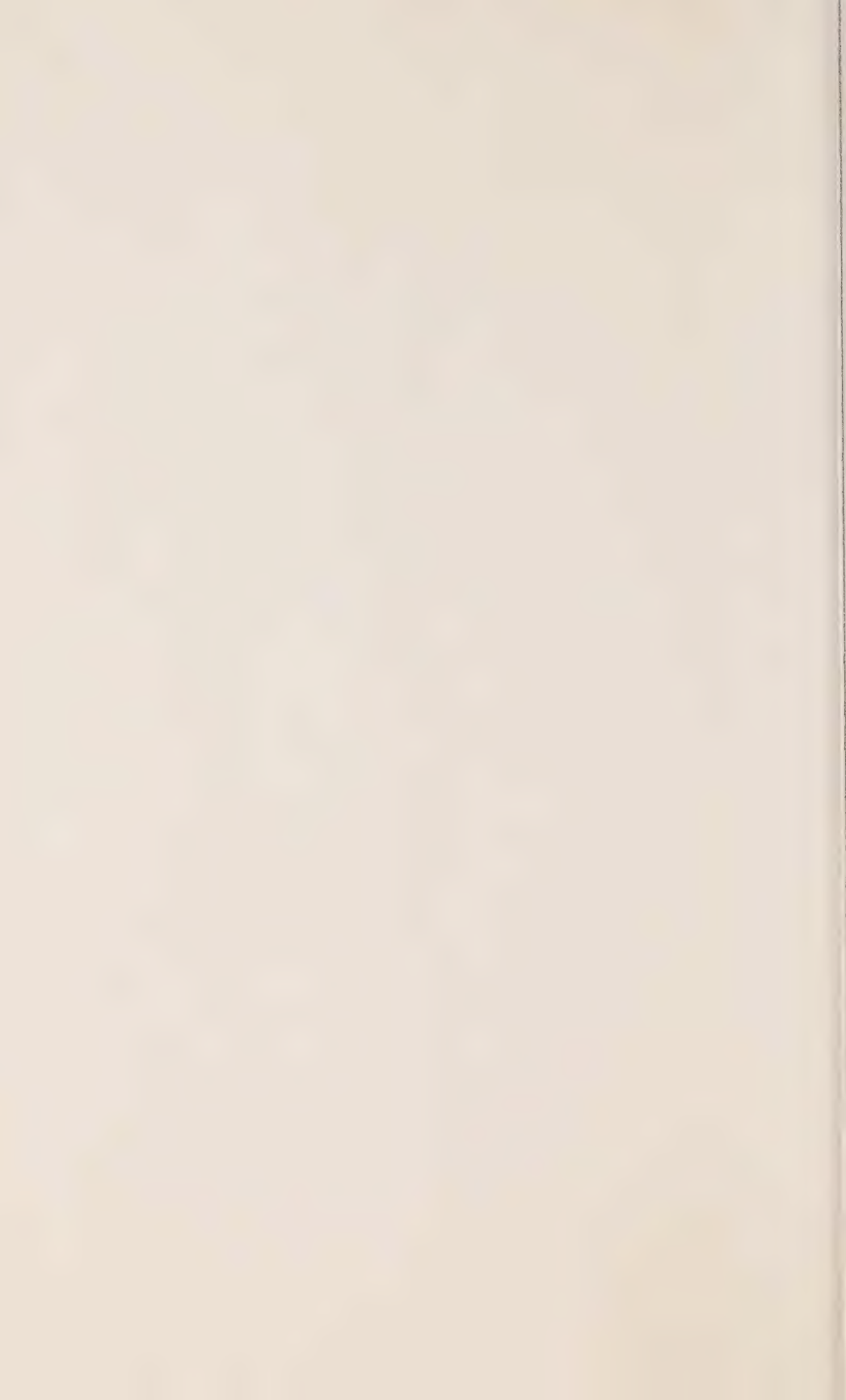
(1) Payment in 1964-65 covered accumulated deficits 1959-64.

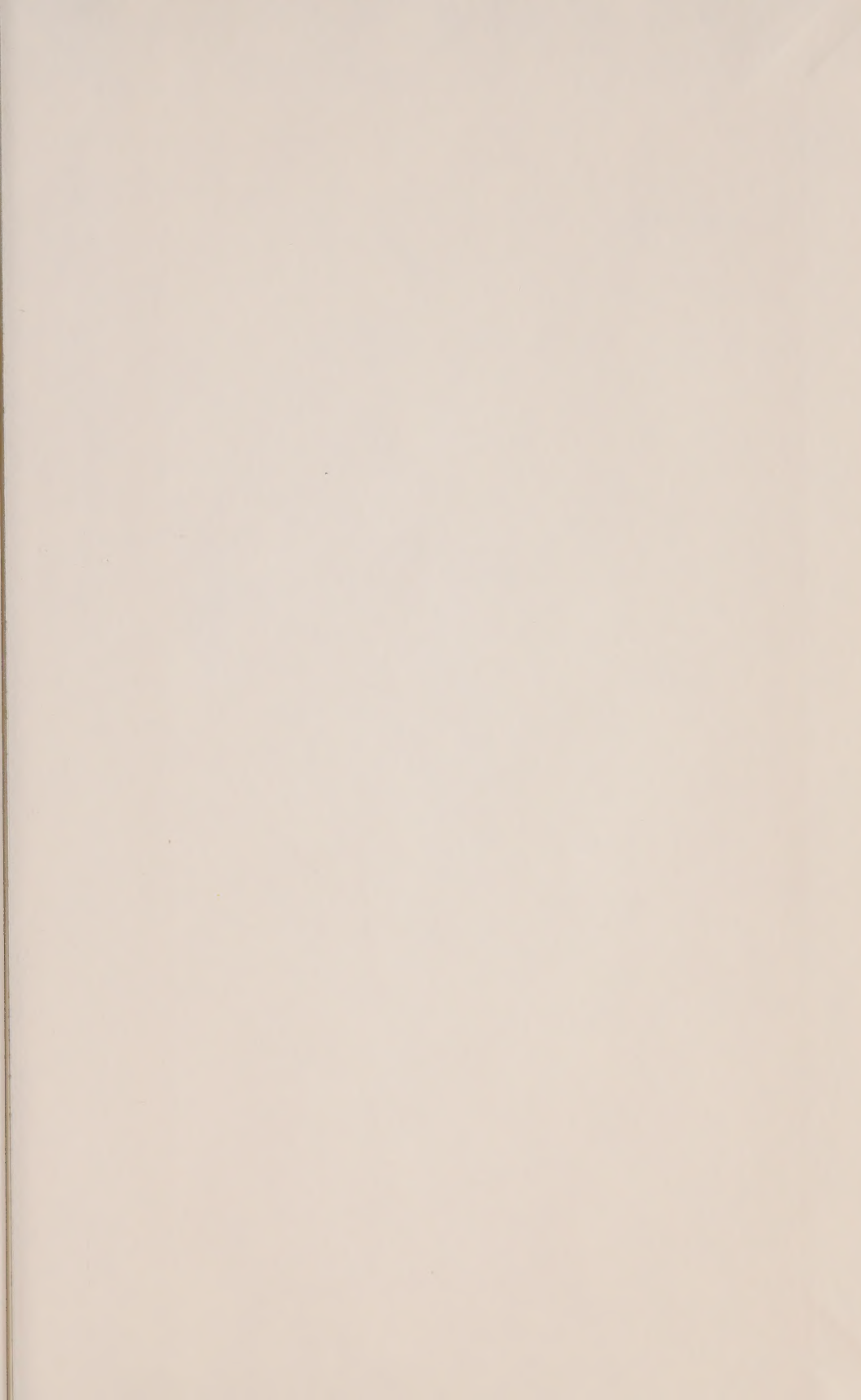
DEPARTMENT OF TRANSPORT
RAILWAY AND STEAMSHIP SERVICES
EXPENDITURES FOR THE FISCAL YEARS 1958-59 TO 1967-68 INCLUSIVE



DEPARTMENT OF TRANSPORT

AIR SERVICES-ADMINISTRATION OPERATION AND MAINTENANCE EXPENDITURES
FOR THE FISCAL YEARS 1958-59 TO 1967-68 INCLUSIVE





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